STIC Search Report
EIC 1700

Scientific & Technical Information Center
USPTO

STIC Database Tracking Number: 146880

TO: Sin J Lee
Location: REM 9D60
Art Unit : 1752
March 15, 2005

Case Serial Number: 09/992560/B

From: Kathleen Fuller
Location: EIC 1700
REMSEN 4B28
Phone: 571/272-2505
Kathleen.Fuller@uspto.gov

Search Notes

146880

For Cl. # 11 & 14

sira
Search and Information Resources Administration

STIC Search Results Feedback Form

EIC17000

Questions about the scope or the results of the search? Contact ***the EIC searcher or contact***:

Kathleen Fuller, EIC 1700 Team Leader
571/272-2505 REMSEN 4B28

Voluntary Results Feedback Form

- *I am an examiner in Workgroup:* ☐ *Example: 1713*
- *Relevant prior art **found**, search results used as follows:*
  - ☐ 102 rejection
  - ☐ 103 rejection
  - ☐ Cited as being of interest.
  - ☐ Helped examiner better understand the invention.
  - ☐ Helped examiner better understand the state of the art in their technology.

  Types of relevant prior art found:
  - ☐ Foreign Patent(s)
  - ☐ Non-Patent Literature
    (journal articles, conference proceedings, new product announcements etc.)

- *Relevant prior art **not found:***
  - ☐ Results verified the lack of relevant prior art (helped determine patentability).
  - ☐ Results were not useful in determining patentability or understanding the invention.

Comments:

Drop off or send completed forms to EIC1700 REMSEN 4B28

sira
Search and Information Resources Administration

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146880

SEARCH REQUEST FORM

Scientific and Technical Information Center

Requester's Full Name: Sin J. Lee Examiner # : 76060 Date: 2/24/05
Art Unit: 1752 Phone Number 302-1333 Serial Number: 09/992,560
Mail Box and Bldg/Room Location: 9D60 (Rem) Results Format Preferred (circle): PAPER DISK E-MAIL

If more than one search is submitted, please prioritize searches in order of need.

Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: BIB attached

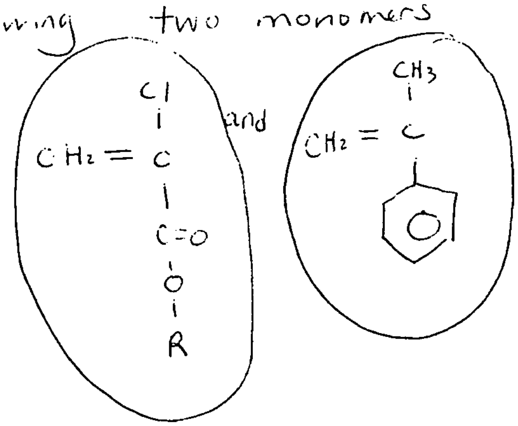
Inventors (please provide full names):

Earliest Priority Filing Date:

**For Sequence Searches Only* Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.*

Please search for a polymer made

from the following two monomers



(R= alkyl group (substituted, unsubstituted, cyclic, branched, or straight alkyl)

STAFF USE ONLY

Searcher: K. Fuller	**Type of Search**		**Vendors and cost where applicable**	
Searcher Phone #:	NA Sequence (#)		STN	✓
Searcher Location:	AA Sequence (#)		Dialog	
Date Searcher Picked Up:	Structure (#)	4	Questel/Orbit	
Date Completed: 3/15/05	Bibliographic		Dr.Link	
Searcher Prep & Review Time: 20	Litigation		Lexis/Nexis	
Clerical Prep Time:	Fulltext		Sequence Systems	
Online Time: 20	Patent Family		WWW/Internet	
	Other		Other (specify)	

PTO-1590 (8-01)

=> FILE REG
FILE 'REGISTRY' ENTERED AT 12:07:23 ON 15 MAR 2005

Property values tagged with IC are from the ZIC/VINITI data file provided by InfoChem.

STRUCTURE FILE UPDATES: 14 MAR 2005 HIGHEST RN 845540-96-7
DICTIONARY FILE UPDATES: 14 MAR 2005 HIGHEST RN 845540-96-7

TSCA INFORMATION NOW CURRENT THROUGH JANUARY 18, 2005

Please note that search-term pricing does apply when conducting SmartSELECT searches.

Crossover limits have been increased. See HELP CROSSOVER for details.

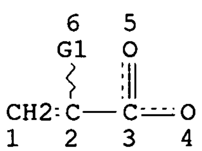
Experimental and calculated property data are now available. For more information enter HELP PROP at an arrow prompt in the file or refer to the file summary sheet on the web at:
http://www.cas.org/ONLINE/DBSS/registryss.html

=> FILE HCAPLU
FILE 'HCAPLUS' ENTERED AT 12:07:29 ON 15 MAR 2005

FILE COVERS 1907 - 15 Mar 2005 VOL 142 ISS 12
FILE LAST UPDATED: 14 Mar 2005 (20050314/ED)

This file contains CAS Registry Numbers for easy and accurate substance identification.

=> D QUE L31
L1 STR



VAR G1=H/CH3/CL

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NODE ATTRIBUTES:
DEFAULT MLEVEL IS ATOM
DEFAULT ECLEVEL IS LIMITED

GRAPH ATTRIBUTES:
RING(S) ARE ISOLATED OR EMBEDDED
NUMBER OF NODES IS   6

STEREO ATTRIBUTES: NONE
L3                SCR 2043
L5         279001 SEA FILE=REGISTRY SSS FUL L1 AND L3
L16               STR 1
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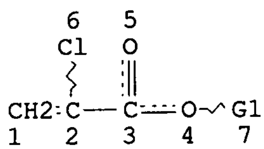

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NODE ATTRIBUTES:
DEFAULT MLEVEL IS ATOM
DEFAULT ECLEVEL IS LIMITED

GRAPH ATTRIBUTES:
RING(S) ARE ISOLATED OR EMBEDDED
NUMBER OF NODES IS   7

STEREO ATTRIBUTES: NONE
L17               STR 2
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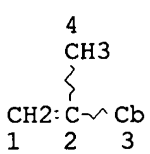

polymer
43 structures from 1 and 2

23 " when
limited to 2 monomers
in the polymer

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NODE ATTRIBUTES:
DEFAULT MLEVEL IS ATOM
DEFAULT ECLEVEL IS LIMITED

GRAPH ATTRIBUTES:
RING(S) ARE ISOLATED OR EMBEDDED
NUMBER OF NODES IS   4

STEREO ATTRIBUTES: NONE
L20            43 SEA FILE=REGISTRY SUB=L5 SSS FUL L16 AND L17
L24            23 SEA FILE=REGISTRY ABB=ON  L20 AND 2/NC
L25           179 SEA FILE=HCAPLUS ABB=ON  L24
L26           120 SEA FILE=HCAPLUS ABB=ON  L25(L)?RESIST?
L27           110 SEA FILE=HCAPLUS ABB=ON  L26 AND REPROG?/SC
L28            70 SEA FILE=HCAPLUS ABB=ON  L27 AND LITHOG?
L29            23 SEA FILE=HCAPLUS ABB=ON  L28 AND (RESOLU? OR RESOLV?)
L30            29 SEA FILE=HCAPLUS ABB=ON  L27 AND NANO?
L31            43 SEA FILE=HCAPLUS ABB=ON  L29 OR L30

=> D L31 BIB ABS IND HITSTR 1-43
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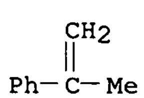
L31 ANSWER 1 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 2004:106005 HCAPLUS
DN 141:61987
TI Improvement of **resolution** in x-ray **lithography** by reducing secondary electron blur
AU Kise, K.; Watanabe, H.; Itoga, K.; Sumitani, H.; Amemiya, M.
CS Advanced Technology R&D Center, Mitsubishi Electric Corporation, Amagasaki, Hyogo, 661-8661, Japan
SO Journal of Vacuum Science & Technology, B: Microelectronics and Nanometer Structures--Processing, Measurement, and Phenomena (2004), 22(1), 126-130
CODEN: JVSTBM; ISSN: 1071-1023
PB American Institute of Physics
DT Journal
LA English
AB In x-ray **lithog.**, the energy deposition mechanism of secondary electrons generated in the resist and Si substrate is investigated. By reducing resist thickness, the secondary electron blur is reduced because secondary electrons with high energy exit the resist before depositing energy in the lateral direction. **Resolution** is improved using a thin Cl-containing resist, especially in wavelengths shorter than the K-shell absorption edge of Cl atoms. The secondary electron blur in the wavelength region from 2.5 to 4.0 Å decreases using a 40-nm-thick Cl-containing resist with a bottom layer. By using an x ray in this wavelength region, the 35 nm line-and-space pattern can be **resolved** at a gap of 10 μm. A higher quality resist pattern can be obtained by increasing the Cl contents in the resist.
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
ST improvement **resoln** x ray **lithog** secondary electron blur redn
IT Photoresists
  Resolution (separation)
X-ray **lithography**
  (improvement of **resolution** in x-ray **lithog.** by reducing secondary electron blur)
IT **43127-35-1**, ZEP 520
RL: TEM (Technical or engineered material use); USES (Uses)
  (Cl-containing **photoresist**; improvement of **resolution** in x-ray **lithog.** by reducing secondary electron blur)
IT **43127-35-1**, ZEP 520
RL: TEM (Technical or engineered material use); USES (Uses)
  (Cl-containing **photoresist**; improvement of **resolution** in x-ray **lithog.** by reducing secondary electron blur)
RN 43127-35-1 HCAPLUS
CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

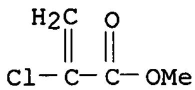
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



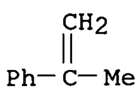
RE.CNT 13 THERE ARE 13 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L31 ANSWER 2 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 2003:547032 HCAPLUS
DN 139:204952
TI Line-edge roughness: Characterization and material origin
AU Yamaguchi, Toru; Yamazaki, Kenji; Nagase, Masao; Namatsu, Hideo
CS NTT Basic Research Laboratories, NTT Corporation, Kanagawa, 243-0198, Japan
SO Japanese Journal of Applied Physics, Part 1: Regular Papers, Short Notes & Review Papers (2003), 42(6B), 3755-3762
CODEN: JAPNDE
PB Japan Society of Applied Physics
DT Journal
LA English
AB Line-edge roughness (LER) is a serious problem in **nanolithog.** as pattern sizes shrink. Two critical issues concerning the LER of resist patterns are its characterization and its origin. In this study, characterization involved estimating the LER of 300-nm line-&-space patterns in ZEP520 resist of various thicknesses by three standard metrol. methods: top-down scanning electron microscope (SEM) method, top-down atomic force microscope (AFM) method, and sidewall AFM method. The authors review these methods and compare their results. Regarding the origin, sidewall AFM measurements revealed polymer aggregates naturally contained in resist films to be the origin of LER in chain-scission-type resists. How the aggregates contribute to LER during the development process was also clarified.
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
ST resist line edge roughness characterization method
IT Atomic force microscopes
Resists
Scanning electron microscopes
Surface roughness
Thickness
(comparison of methods for determination of resist line-edge roughness)
IT Electron beam resists
(pos.-working; comparison of methods for determination of resist line-edge roughness)
IT **43127-35-1**, ZEP 520
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(ZEP 520; comparison of methods for determination of **resist** line-edge roughness)

IT 142-92-7, Hexyl acetate
RL: NUU (Other use, unclassified); USES (Uses)
(developer; comparison of methods for determination of resist line-edge roughness)
IT **43127-35-1**, ZEP 520
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(ZEP 520; comparison of methods for determination of **resist** line-edge roughness)
RN 43127-35-1 HCAPLUS
CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

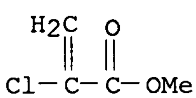
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



RE.CNT 37 THERE ARE 37 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L31 ANSWER 3 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 2003:221142 HCAPLUS
DN 138:392969
TI Study of chemically amplified resist using an electron beam recorder
AU Kasono, Osamu; Sugimoto, Tatsuya; Katsumura, Masahiro; Higuchi, Takanobu; Kojima, Yoshiaki; Iida, Tetsuya
CS Corporate Research and Development Laboratories, Pioneer Corporation, Saitama, 350-2288, Japan
SO Japanese Journal of Applied Physics, Part 1: Regular Papers, Short Notes & Review Papers (2003), 42(2B), 764-768
CODEN: JAPNDE
PB Japan Society of Applied Physics
DT Journal
LA English
AB The authors were developing an electron beam recorder for next-generation optical disk mastering. Using a ZEP-520 resist that had high **resolution**, the authors fabricated read-only memory disks and obtained sufficient reproduction performance. But the recording velocity was 0.7 m/s to obtain sufficient jitter of the disk. The authors could not

expect such low recording velocity to be used in mass production Therefore the authors decided to use a chemical amplified resist, which had high sensitivity. To reduce the recording time, the authors adopted the resist to the optical disk mastering and investigated the process conditions. The authors examined the effect of development power and post-exposure banking (PEB) temperature on the jitter of the reproduced signals and obtained 6.4% jitter at a 2.5 m/s recording velocity.

CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)

ST **lithog** chem amplified resist electron beam mastering optical disk

IT Electron beam **lithography**
Optical ROM disks
(application of chemical amplified resist to high-speed electron-beam mastering of optical disks)

IT Electron beam resists
(chemical amplified; application of chemical amplified resist to high-speed electron-beam mastering of optical disks)

IT **43127-35-1**, ZEP-520
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(ZEP-520; application of chemical amplified **resist** to high-speed electron-beam mastering of optical disks)

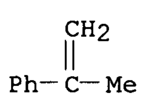
IT **43127-35-1**, ZEP-520
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(ZEP-520; application of chemical amplified **resist** to high-speed electron-beam mastering of optical disks)

RN 43127-35-1 HCAPLUS

CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

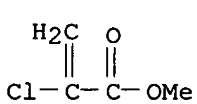
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



RE.CNT 5 THERE ARE 5 CITED REFERENCES AVAILABLE FOR THIS RECORD

ALL CITATIONS AVAILABLE IN THE RE FORMAT

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L31  ANSWER 4 OF 43  HCAPLUS  COPYRIGHT 2005 ACS on STN
AN   2002:918496  HCAPLUS
DN   138:18051
TI   Positive-working photoresist composition containing specific polymer
IN   Senoo, Masahide; Tamura, Kazutaka; Nio, Hiroyuki
PA   Toray Industries, Inc., Japan
SO   Jpn. Kokai Tokkyo Koho, 9 pp.
     CODEN: JKXXAF
DT   Patent
LA   Japanese
FAN.CNT 1
     PATENT NO.          KIND  DATE       APPLICATION NO.         DATE
     ---------------     ----  --------   --------------------    --------
PI   JP 2002351080        A2   20021204   JP 2001-158324          20010528
PRAI JP 2001-158324            20010528
AB   The composition contains a polymer and a photoacid generator , wherein the
     polymer has repeating unit [CH2-C(X)(COO-C(R1)(R2)(R3))] (X = H, C1-6
     alkyl, halo; R1-3 = C1-6 alkyl, C6-15 aryl, C7-16 aralkyl, etc.) and is
     prepared using photopolymn. initiator (R4)(R5)(R6)C-N=N-C(R7)(R8)(R9),
     R10-COO-OCOR11, or R12-O-O-R13( R4-13 = H, C1-12 alkyl, C1-6 alkyl ester,
     etc.).  The composition provides high resolution pattern of subquarter
     micron feature and is suitable for manufacturing semiconductor devices and
     lithog. masks.
IC   ICM  G03F007-039
     ICS  C08F004-00; C08F020-18; C08F020-22; C08K005-00; C08L033-04;
          H01L021-027
CC   74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other
     Reprographic Processes)
     Section cross-reference(s): 35
ST   pos photoresist compn polymer
IT   Light-sensitive materials
     Photoresists
        (pos.-working photoresist composition)
IT   110-05-4, tert-Butyl peroxide   2589-57-3, Dimethyl 2,2'-
     azobis(isobutyrate) 383908-05-2   477557-75-8   477557-77-0
     RL: CAT (Catalyst use); USES (Uses)
        (pos.-working photoresist composition)
IT   477557-74-7P
     RL: SPN (Synthetic preparation); TEM (Technical or engineered material
     use); PREP (Preparation); USES (Uses)
        (pos.-working photoresist composition)
IT   383908-05-2
     RL: CAT (Catalyst use); USES (Uses)
        (pos.-working photoresist composition)
RN   383908-05-2  HCAPLUS
CN   2-Propenoic acid, 2-chloro-, 1,1-diphenylethyl ester, polymer with
     4-(1-methylethenyl)phenol (9CI)  (CA INDEX NAME)

     CM   1

     CRN  383908-04-1
     CMF  C17 H15 Cl O2
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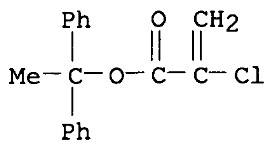
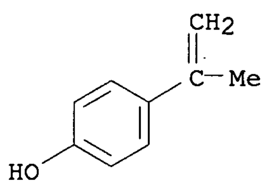


CM 2

CRN 4286-23-1
CMF C9 H10 O

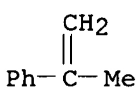


L31 ANSWER 5 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 2002:897564 HCAPLUS
DN 138:128907
TI Resist thinning effect on **nanometer**-scale line-edge roughness
AU Kanzaki, Kenichi; Yamaguchi, Toru; Nagase, Masao; Yamazaki, Kenji; Namatsu, Hideo
CS NTT Basic Research Laboratories, NTT Corporation, Kanagawa, 243-0198, Japan
SO Japanese Journal of Applied Physics, Part 2: Letters (2002), 41(11B), L1342-L1344
CODEN: JAPLD8
PB Japan Society of Applied Physics
DT Journal
LA English
AB The thickness dependence of the roughness of ultrathin (≤ 100 nm) electron-beam resist (ZEP520) was investigated using an atomic force microscope (AFM). The roughness (linewidth fluctuations of line patterns) increased with decreasing resist thickness, especially below 30 nm. On the other hand, polymer aggregates, which are well observed in conventional resists, existed in compressed form even in this ultrathin film. In addition, the dissoln. rate of the resist tended to be faster with thickness reduction Both the existence of polymer aggregates and the fast dissoln. of the entire resist polymer possibly caused the larger roughness in the ultrathin resist films.
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
ST lithog electron beam resist line edge roughness thickness effect
IT Dissolution
(kinetics; line-edge roughness of fine lines in ultrathin electron-beam resist ZEP520 as function of resist thickness)
IT Electron beam resists
Surface roughness
Thickness
(line-edge roughness of fine lines in ultrathin electron-beam resist

ZEP520 as function of resist thickness)
IT **43127-35-1**, ZEP520
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(ZEP520; line-edge roughness of fine lines in ultrathin electron-beam **resist** ZEP520 as function of **resist** thickness)
IT 142-92-7, Hexyl acetate
RL: NUU (Other use, unclassified); USES (Uses)
(developer; line-edge roughness of fine lines in ultrathin electron-beam resist ZEP520 as function of resist thickness)
IT **43127-35-1**, ZEP520
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(ZEP520; line-edge roughness of fine lines in ultrathin electron-beam **resist** ZEP520 as function of **resist** thickness)
RN 43127-35-1 HCAPLUS
CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

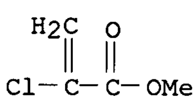
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



RE.CNT 11 THERE ARE 11 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L31 ANSWER 6 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 2002:716627 HCAPLUS
DN 137:270509
TI High **resolution** resists comprising **nanoparticles** and inorganic moieties for next generation **lithographies**
IN Gonsalves, Kenneth E.
PA University of North Carolina at Charlotte, USA; University of Connecticut
SO PCT Int. Appl., 62 pp.
CODEN: PIXXD2
DT Patent
LA English
FAN.CNT 1

applicant

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE

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PI   WO 2002073308         A1    20020919    WO 2002-US7338          20020311
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             CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,
             GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR,
             LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH,
             PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ,
             UA, UG, US, UZ, VN, YU, ZA, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU,
             TJ, TM
         RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AT, BE, CH,
             CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR,
             BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG
     US 2002182541         A1    20021205    US 2001-992560          20011105
     EP 1377876            A1    20040107    EP 2002-723388          20020311
         R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT,
             IE, SI, LT, LV, FI, RO, MK, CY, AL, TR
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PRAI US 2001-274719P       P     20010312
     WO 2002-US7338        W     20020311
GI
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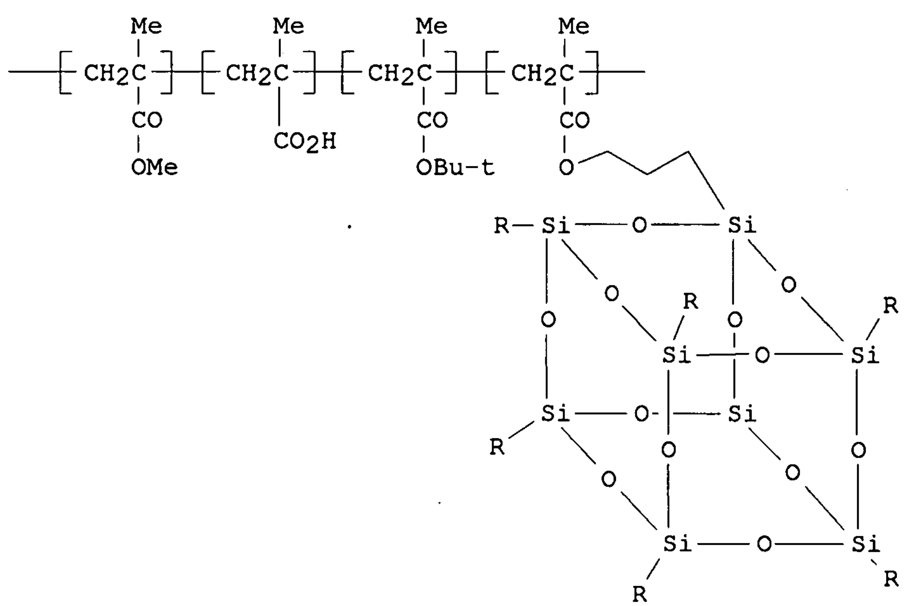


I

AB The present invention provides new high **resolution** resists applicable to next generation **lithogs.**, methods of making these novel resists, and methods of using these new resists in **lithog.** processes to effect state-of-the-art **lithogs.** New **nanocomposite** resists comprising polymers of the general formula I (R = alkyl, cycloalkyl, silyl, aryl, aralkyl, alkenyl) and **nanoparticles** in a polymer matrix are provided in the invention. New chemical amplified resists that incorporate inorg. moieties as part of

the polymer and chemical amplified resists that incorporate photoacid generating groups within the polymeric chain are presented. Novel non-chemical amplified yet photosensitive resists, and new organic-inorg. hybrid resists are also provided. This invention and the embodiments described constitute fundamentally new architectures for high **resolution** resists that achieve high sensitivity, contrast, **resolution** and high plasma etch resistance.

IC ICM G03C001-725
ICS G03F007-039; G03F007-075; G03F007-26

CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
Section cross-reference(s): 38, 76

ST chem amplified resist **nanoparticle** silsesquioxane photoacid generator copolymer polymer; **lithog** electron ion beam x ray chem amplified resist; photolithog UV chem amplified resist **nanoparticle** silsesquioxane

IT Photolithography
(UV; chemical amplified resists comprising copolymers with sulfonium photoacid generator monomer for)

IT Resists
(chemical amplified resists comprising copolymers with sulfonium photoacid generator monomer)

IT Electron beam **lithography**
Ion beam **lithography**
X-ray **lithography**
(chemical amplified resists comprising copolymers with sulfonium photoacid generator monomer for)

IT Integrated circuits
(chemical amplified resists comprising copolymers with sulfonium photoacid generator monomer for fabrication of)

IT Polyoxymethylenes, preparation
RL: PNU (Preparation, unclassified); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(chemical amplified resists comprising polyacetals)

IT Silsesquioxanes
RL: TEM (Technical or engineered material use); USES (Uses)
(chemical amplified resists comprising polyhydral oligosilsesquioxanes, **nanoparticles** and inorg. moieties)

IT **43127-35-1**, ZEP 520
RL: TEM (Technical or engineered material use); USES (Uses)
(ZEP 520; chemical amplified **resists** comprising polyhydral oligosilsesquioxanes, **nanoparticles** and inorg. moieties)

IT 352455-55-1P 362675-17-0P 461699-74-1P
RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(chemical amplified resists comprising copolymers with sulfonium photoacid generator monomer)

IT 461699-77-4P 461699-80-9P
RL: PNU (Preparation, unclassified); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(chemical amplified resists comprising polyacetals)

IT 359408-40-5P
RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(chemical amplified resists comprising polyhydral oligosilsesquioxanes, **nanoparticles** and inorg. moieties)

IT 136849-03-1

RL: TEM (Technical or engineered material use); USES (Uses)
(chemical amplified resists comprising polyhydral oligosilsesquioxanes, **nanoparticles** and inorg. moieties)

IT 338731-99-0P
RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(chemical amplified resists comprising sulfonium photoacid generator polymer)

IT 2170-03-8, Itaconic anhydride
RL: TEM (Technical or engineered material use); USES (Uses)
(dissoln. promoter; chemical amplified resists comprising copolymers with sulfonium photoacid generator monomer)

IT 352455-54-0P
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(in preparation of copolymers containing sulfonium photoacid generator monomer)

IT 108-95-2, Phenol, reactions 920-46-7, Methacryloyl chloride
RL: RCT (Reactant); RACT (Reactant or reagent)
(in preparation of sulfonium photoacid generator monomer)

IT 1005-35-2P 301152-82-9P 364325-13-3P
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(in preparation of sulfonium photoacid generator monomer)

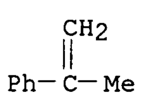
IT **43127-35-1**, ZEP 520
RL: TEM (Technical or engineered material use); USES (Uses)
(ZEP 520; chemical amplified **resists** comprising polyhydral oligosilsesquioxanes, **nanoparticles** and inorg. moieties)

RN 43127-35-1 HCAPLUS

CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

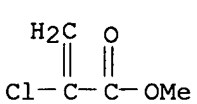
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



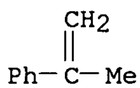
RE.CNT 4 THERE ARE 4 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L31 ANSWER 7 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 2002:633416 HCAPLUS
DN 137:302027
TI Characteristics of CA resist in EUV **lithography**
AU Hamamoto, Kazuhiro; Watanabe, Takeo; Hada, Hideo; Komano, Hiroshi; Kinoshita, Hiroo
CS Laboratory of Advanced Science and Technology for Industry, Himeji Institute of Technology, Hyogo, 678-1205, Japan
SO Journal of Photopolymer Science and Technology (2002), 15(3), 361-366
CODEN: JSTEEW; ISSN: 0914-9244
PB Technical Association of Photopolymers, Japan
DT Journal
LA English
AB According to the synchronous scanning of the mask and wafer with EUVL laboratory
tool (ETS-1) with reduction optical system which consisted of three-aspherical-mirror in the NewSUBARU facilities succeeded in the line of 60 nm and the space pattern formation in the exposure region of 10 mm + 10 mm. Comparing the result of exposure characteristics for pos.-tone resist for KrF and electron-beam, KrF chemical amplified (CA) resist has better characteristics than electron-beam chemical amplified resist. The development of suitable resist for extreme-UV (EUV) **lithog.** that the **resolution** performance and sensitivity are good, and the amount of outgassing is low will be advanced based on KrF resist.
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
ST exposure characteristics pos photoresist extreme UV **lithog**; electron beam resist characteristics extreme UV **lithog**; chem amplified resist exposure characteristics extreme UV photolithog
IT Positive photoresists
(chemical amplified; evaluation of exposure characteristics of pos.-tone photoresists and electron-beam resists for application in extreme-UV **lithog.**)
IT Positive photoresists
(evaluation of exposure characteristics of pos.-tone photoresists and electron-beam resists for application in extreme-UV **lithog.**)
IT Electron beam resists
(pos.-working, chemical amplified; evaluation of exposure characteristics of pos.-tone photoresists and electron-beam resists for application in extreme-UV **lithog.**)
IT Electron beam resists
(pos.-working; evaluation of exposure characteristics of pos.-tone photoresists and electron-beam resists for application in extreme-UV **lithog.**)
IT **43127-35-1**, ZEP-520
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(evaluation of exposure characteristics of pos.-tone **photoresists** and electron-beam **resists** for application in extreme-UV **lithog.**)
IT **43127-35-1**, ZEP-520
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(evaluation of exposure characteristics of pos.-tone **photoresists** and electron-beam **resists** for application in extreme-UV **lithog.**)
RN 43127-35-1 HCAPLUS

CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with
(1-methylethenyl)benzene (9CI) (CA INDEX NAME)

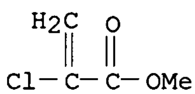
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



RE.CNT 13 THERE ARE 13 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L31 ANSWER 8 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 2002:580748 HCAPLUS
DN 138:17971
TI **Nanocomposite** resist systems for next generation **lithography**
AU Merhari, L.; Gonsalves, K. E.; Hu, Y.; He, W.; Huang, W.-S.; Angelopoulos, M.; Bruenger, W. H.; Dzionk, C.; Torkler, M.
CS CERAMEC R&D, Limoges, F-87000, Fr.
SO Microelectronic Engineering (2002), 63(4), 391-403
CODEN: MIENEF; ISSN: 0167-9317
PB Elsevier Science B.V.
DT Journal
LA English
AB A novel **nanocomposite** resist system was developed for sub-100 nm **resolution** electron-beam **lithog.** by dispersing surface-treated silica **nanoparticles** in a com. ZEP520 resist. At 4.0 weight% loading of silica **nanoparticles,** the system exhibited a much higher **resolution** than ZEP520 without sacrificing the intrinsic sensitivity and contrast of the starting polymer. The first major result is that 46 nm-wide isolated lines were obtained in the **nanocomposite** system (.apprx.250 nm-thick layer), whereas comparatively 130 nm-wide lines were obtained in ZEP520 under the same exptl. conditions. Contrary to standard electron-beam resists, this important reduction of line broadening already occurred at 20 keV while higher energy electron-beams (up to 100 keV) did not lead to further line broadening reduction Moreover, it was shown that the addition of silica **nanoparticles** resulted in a higher resistance of the **nanocomposite** to plasma etching with O2 gas. Subjecting this **nanocomposite** resist to 75-keV Xe+ ion irradiation showed that it is

also particularly suitable for ion projection **lithog.** as a
preliminary **resolution** of 114 nm (1/s) was obtained while the
sensitivity increased by a factor of 40 compared to 30-keV electrons.
Extending the **nanocomposite** approach to KRS-XE, a chemical
amplified resist, led to both enhanced **resolution** and mech.
stability for electron beam **lithog.** The major **resolution**
and etch resistance improvements in both resist systems indicate that
nanocomposite systems are promising candidates not only for
sub-100 nm **resolution** electron-beam **lithog.** but also for
ion projection **lithog.** Supported by preliminary Monte Carlo
simulations a tentative mechanism highlighting the electron-
nanocomposite interactions as the explanation for line broadening
reduction is proposed.

CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)

ST silica **nanoparticle** ZEP520 **nanocomposite** resist
electron ion beam **lithog**; polymer silica **nanoparticle**
nanocomposite resist electron ion beam **lithog**; KRSXE
silica **nanoparticle** **nanocomposite** resist electron ion
beam **lithog**

IT Simulation and Modeling, physicochemical
(Monte Carlo; characterization of **nanocomposite** SiO_2/ZEP520
or SiO_2/KRS-XE resists for electron- and ion-beam **lithog.**)

IT Electron beam resists
Electron beams
Ion beam resists
(characterization of **nanocomposite** SiO_2/ZEP520 or SiO_2/KRS-XE
resists for electron- and ion-beam **lithog.**)

IT 7631-86-9D, Silica, surface modified with alkyl-alkenyl groups
43127-35-1, ZEP520 302353-92-0, KRS-XE
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(characterization of **nanocomposite** SiO_2/ZEP520 or SiO_2/KRS-XE
resists for electron- and ion-beam **lithog.**)

IT 24203-25-6, Xenon(1+), uses
RL: NUU (Other use, unclassified); USES (Uses)
(ion-bam; characterization of **nanocomposite** SiO_2/ZEP520 or
SiO_2/KRS-XE resists for electron- and ion-beam **lithog.**)

IT 7782-44-7, Oxygen, uses
RL: NUU (Other use, unclassified); USES (Uses)
(plasma etch; characterization of **nanocomposite** SiO_2/ZEP520
or SiO_2/KRS-XE resists for electron- and ion-beam **lithog.**)

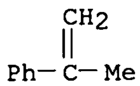
IT **43127-35-1**, ZEP520
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(characterization of **nanocomposite** SiO_2/ZEP520 or SiO_2/KRS-XE
resists for electron- and ion-beam **lithog.**)

RN 43127-35-1 HCAPLUS

CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with
(1-methylethenyl)benzene (9CI) (CA INDEX NAME)

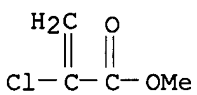
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



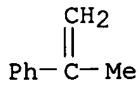
RE.CNT 15 THERE ARE 15 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L31 ANSWER 9 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 2002:535308 HCAPLUS
DN 137:239609
TI Improvement of imprinted pattern uniformity using sapphire mold
AU Komuro, Masanori; Tokano, Yuji; Taniguchi, Jun; Kawasaki, Takeshi; Miyamoto, Iwao; Hiroshima, Hiroshi
CS Advanced Semiconductor Research Center, AIST Tsukuba Central 2, National Institute of Advanced Industrial Science and Technology, Tsukuba, 305-8568, Japan
SO Japanese Journal of Applied Physics, Part 1: Regular Papers, Short Notes & Review Papers (2002), 41(6B), 4182-4185
CODEN: JAPNDE
PB Japan Society of Applied Physics
DT Journal
LA English
AB In order to improve the adhesion property between a mold and photocurable polymer film in photosolidified imprint lithog., a sapphire plate was used which has advantages such as large Young's modulus, large Knoop hardness value, and large ultimate compressive and tensile forces compared with a quartz plate. The contact angle of water on the sapphire surface is considerably larger than that on the quartz surface and comparable with that on the quartz surface with hydrophobic treatment. As the number of imprinting expts. increases, the contact angle for the sapphire remains constant although that for the surface-treated quartz gradually decreases. From the 40 imprinting expts. using the same sapphire mold, no degradation of the replicated pattern in the photocurable polymer is observed On the other hand, thin polymer residues are observed to remain at the edge of the protruding mold patterns, probably due to the rough side wall structures which made them easy to adhere to the polymer. It is considered that such a residual polymer film on the mold is too thin to be replicated in the imprinting experiment
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
ST sapphire mold improved adhesion imprint lithog
IT Adhesion, physical
Contact angle
(imprint lithog. using sapphire mold having improved adhesion to

photocurable polymer composition PAK01)
IT Electron beam lithography
(in fabrication of sapphire mold for imprint lithog. with improved adhesion to photocurable polymer film)
IT Lithography
(**nanoimprint**; improvement of imprinted pattern uniformity using sapphire mold)
IT 7664-38-2, Phosphoric acid, processes
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process)
(Al etching agent; in fabrication of sapphire mold for imprint lithog. with improved adhesion to photocurable polymer film)
IT 60676-86-0, Vitreous silica
RL: NUU (Other use, unclassified); USES (Uses)
(comparison mold; improvement of adhesion property between sapphire mold and photocurable polymer film in photosolidified imprint lithog.)
IT **43127-35-1**, ZEP 520
RL: TEM (Technical or engineered material use); USES (Uses)
(electron **resist**; in fabrication of sapphire mold for imprint lithog. with improved adhesion to photocurable polymer film)
IT 457917-21-4, PAK 01
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process)
(imprint lithog. using sapphire mold having improved adhesion to photocurable polymer composition PAK 01)
IT 85922-82-3, Tripropylene glycol diacrylate homopolymer
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process)
(imprint lithog. using sapphire mold having improved adhesion to photocurable polymer composition PAK01 containing)
IT 7429-90-5, Aluminum, processes
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process)
(lift-off step; in fabrication of sapphire mold for imprint lithog. with improved adhesion to photocurable polymer film)
IT 1317-82-4, Sapphire
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); PROC (Process); USES (Uses)
(mold; sapphire mold for imprint lithog. having improved adhesion to photocurable polymer film)
IT 75-46-7, Trifluoromethane
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process)
(reactive ion etching; in fabrication of sapphire mold for imprint lithog. with improved adhesion to photocurable polymer film)
IT **43127-35-1**, ZEP 520
RL: TEM (Technical or engineered material use); USES (Uses)
(electron **resist**; in fabrication of sapphire mold for imprint lithog. with improved adhesion to photocurable polymer film)
RN 43127-35-1 HCAPLUS
CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

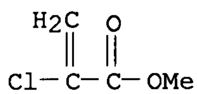
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



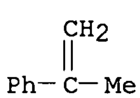
RE.CNT 6 THERE ARE 6 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L31 ANSWER 10 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 2002:501665 HCAPLUS
DN 137:177017
TI **Nanoline** formation by using small-aggregate resist and supercritical resist drying
AU Namatsu, Hideo
CS NTT Basic Research Laboratories, NTT Corporation, Atsugi, 243-0198, Japan
SO Materials Research Society Symposium Proceedings (2002), 705(Nanopatterning: From Ultralarge-Scale Integration to Biotechnology), 61-72
CODEN: MRSPDH; ISSN: 0272-9172
PB Materials Research Society
DT Journal
LA English
AB **Nanolines** as small as 7 nm wide have been formed using a small-aggregate resist and supercrit. resist drying. Aggregates consisting of resist polymers cause pattern roughness and cause **nanolines** to break. Hydrogen silsesquioxane (HSQ) is a resist material in which the aggregates are small due to its three-dimensional network. Development with an aqueous solution of TMAH provides high-contrast patterns. The problem that **nanolines** formed in HSQ collapse after development is solved by a supercrit. resist drying technique. Supercrit. drying suppresses the swelling of the resist by the rinse solution during development and thereby prevents **nanolines** from collapsing. The use of both small-aggregate HSQ resist and supercrit. resist drying enables free-standing **nanolines** with a high aspect ratio to be formed without collapse.
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
ST **nanoline** formation small aggregate resist supercrit drying; hydrogen silsesquioxane small aggregate resist supercrit drying
IT Molecular association
Resists
Supercritical fluids
(**nanoline** formation by using small-aggregate hydrogen silsesquioxane lithog. resist and supercrit. resist drying with CO2)

IT Silsesquioxanes
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**nanoline** formation by using small-aggregate hydrogen silsesquioxane lithog. resist and supercrit. resist drying with CO2)
IT 75-59-2, Tetramethylammonium hydroxide
RL: NUU (Other use, unclassified); USES (Uses)
(developer; **nanoline** formation by using small-aggregate hydrogen silsesquioxane lithog. resist and supercrit. resist drying with CO2)
IT **43127-35-1** 119574-53-7, SAL-601
RL: TEM (Technical or engineered material use); USES (Uses)
(**nanoline** formation by using small-aggregate hydrogen silsesquioxane lithog. **resist** and supercrit. **resist** drying in relation to)
IT 124-38-9, Carbon dioxide, processes
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process)
(**nanoline** formation by using small-aggregate hydrogen silsesquioxane lithog. resist and supercrit. resist drying with CO2)
IT 153315-81-2, Hydrogen silsesquioxane 182889-73-2
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**nanoline** formation by using small-aggregate hydrogen silsesquioxane lithog. resist and supercrit. resist drying with CO2)
IT **43127-35-1**
RL: TEM (Technical or engineered material use); USES (Uses)
(**nanoline** formation by using small-aggregate hydrogen silsesquioxane lithog. **resist** and supercrit. **resist** drying in relation to)
RN 43127-35-1 HCAPLUS
CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

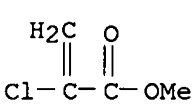
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



RE.CNT 17 THERE ARE 17 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L31 ANSWER 11 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 2002:407174 HCAPLUS
DN 136:409030
TI Radiation-sensitive chemically amplified positive resists and **lithography** using the same
IN Nio, Hiroyuki; Tamura, Kazutaka; Senoo, Masahide
PA Toray Industries, Inc., Japan
SO Jpn. Kokai Tokkyo Koho, 10 pp.
CODEN: JKXXAF
DT Patent
LA Japanese
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 2002156760	A2	20020531	JP 2000-352488	20001120
PRAI	JP 2000-352488		20001120		

AB The resists, showing good sensitivity and high pattern **resolution,** contain (a) compds. or acrylate polymers (Markush given) having carboxyls which are protected with ≥3-aromatic-ring-bearing acid-leaving protective groups and (b) radiation-sensitive acid generators.
IC ICM G03F007-039
ICS C08K005-00; C08L033-04; H01L021-027
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
Section cross-reference(s): 38, 76
ST electron beam resist trityl chloroacrylate polymer; sensitivity **resoln** photoresist trityl protected polymer
IT Photoresists
(UV, i-line; chemical amplified pos. resists containing polymers bearing acid-leaving bulky protective groups for electron beam **lithog**.)
IT Photolithography
(UV; chemical amplified pos. resists containing polymers bearing acid-leaving bulky protective groups for electron beam **lithog.**)
IT Electron beam **lithography**
Electron beam resists
(chemical amplified pos. resists containing polymers bearing acid-leaving bulky protective groups for electron beam **lithog.**)
IT Resists
(radiation-sensitive, pos.; chemical amplified pos. resists containing polymers bearing acid-leaving bulky protective groups for electron beam **lithog.**)
IT 66003-78-9, Triphenylsulfonium triflate
RL: CAT (Catalyst use); PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(acid generators; chemical amplified pos. resists containing polymers bearing acid-leaving bulky protective groups for electron beam **lithog**.)
IT **383908-14-3P,** p-Hydroxy-α-methylstyrene-trityl α-chloroacrylate copolymer
RL: IMF (Industrial manufacture); PEP (Physical, engineering or chemical

process); PYP (Physical process); TEM (Technical or engineered material use); PREP (Preparation); PROC (Process); USES (Uses)
(chemical amplified pos. **resists** containing polymers bearing acid-leaving bulky protective groups for electron beam **lithog** .)

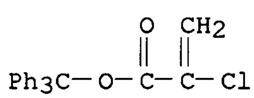
IT 383908-19-8 383908-20-1 383908-22-3 431943-52-1
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(chemical amplified pos. resists containing polymers bearing acid-leaving bulky protective groups for electron beam **lithog.**)

IT **383908-14-3P**, p-Hydroxy-α-methylstyrene-trityl α-chloroacrylate copolymer
RL: IMF (Industrial manufacture); PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PREP (Preparation); PROC (Process); USES (Uses)
(chemical amplified pos. **resists** containing polymers bearing acid-leaving bulky protective groups for electron beam **lithog** .)

RN 383908-14-3 HCAPLUS
CN 2-Propenoic acid, 2-chloro-, triphenylmethyl ester, polymer with 4-(1-methylethenyl)phenol (9CI) (CA INDEX NAME)

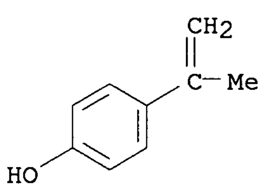
CM 1

CRN 383908-13-2
CMF C22 H17 Cl O2



CM 2

CRN 4286-23-1
CMF C9 H10 O



L31 ANSWER 12 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 2002:90546 HCAPLUS
DN 136:142620
TI Apparatus and methods for patterning a reticle blank by electron-beam inscription with reduced exposure of the reticle blank by backscattered electrons
IN Suganuma, Wakako; Shimizu, Sumito; Yamada, Atsushi; Suzuki, Shohei; Yamamoto, Hajime

PA Nikon Corporation, Japan
SO U.S. Pat. Appl. Publ., 14 pp.
CODEN: USXXCO
DT Patent
LA English
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 2002012853	A1	20020131	US 2001-908628	20010718
	JP 2002110537	A2	20020412	JP 2001-148877	20010518
PRAI	JP 2000-219133	A	20000719		
	JP 2000-223597	A	20000725		
	JP 2001-148877	A	20010518		

AB Apparatus and methods are disclosed for electron-beam patterning of a reticle blank to produce **lithog.** mask with improved pattern **resolution** As a reticle blank is inscribed using a charged particle beam (e.g., electron beam), some of the incident electrons pass through the reticle blank and are backscattered from underlying structure (e.g., from a stage used to hold the reticle blank during inscription). The present apparatus and methods reduce the number of backscattered particles re-entering the reticle blank, thereby improving pattern **resolution** The electron-beam apparatus for pattern writing contains an electron-beam source, an electron-optical system, a stage to hold the blank, and the means for reducing the backscattering of electrons transmitted through the blank or for reducing exposure of the resists by these electrons. The reducing means can comprise an electron trap from electron absorbing material which is located downstream of the stage and configured to trap electron transmitted through the blank and backscattered from the downstream structures. The reducing means can comprise a through-hole defined by a portion of the stage located downstream the blank and electron-absorbing plate located downstream the hole.

IC ICM G03F009-00
ICS G03C005-00; A61N005-00; G21G005-00
NCL 430005000
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
ST **lithog** mask electron beam writing app backscattered electron trap
IT Electron beam **lithography**
(apparatus; electron-beam exposure apparatus containing backscattered electron trap
for fabrication of **lithog.** masks with improved pattern **resolution**)
IT **Lithographic** apparatus
Photomasks (**lithographic** masks)
X-ray masks
(electron-beam exposure apparatus containing backscattered electron trap for fabrication of **lithog.** masks with improved pattern **resolution**)
IT Electron backscattering
(reduction; electron-beam exposure apparatus containing backscattered electron trap
for fabrication of **lithog.** masks with improved pattern **resolution**)
IT 7440-21-3, Silicon, processes
RL: DEV (Device component use); EPR (Engineering process); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(electron-beam exposure apparatus containing backscattered electron trap for

fabrication of **lithog.** masks with improved pattern
resolution)

IT 7440-42-8, Boron, processes
RL: EPR (Engineering process); MOA (Modifier or additive use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(electron-beam exposure apparatus containing backscattered electron trap for fabrication of **lithog.** masks with improved pattern **resolution**)

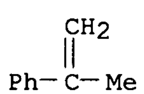
IT **43127-35-1**, ZEP520
RL: EPR (Engineering process); PEP (Physical, engineering or chemical process); PROC (Process)
(**resist**; electron-beam exposure apparatus containing backscattered electron trap for fabrication of **lithog.** masks with improved pattern **resolution**)

IT **43127-35-1**, ZEP520
RL: EPR (Engineering process); PEP (Physical, engineering or chemical process); PROC (Process)
(**resist**; electron-beam exposure apparatus containing backscattered electron trap for fabrication of **lithog.** masks with improved pattern **resolution**)

RN 43127-35-1 HCAPLUS
CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

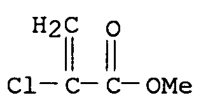
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2

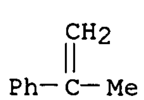


L31 ANSWER 13 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 2001:911514 HCAPLUS
DN 136:270363
TI Effect of resist sensitivity ratio on T-gate fabrication
AU Chen, Y.; MacIntyre, D. S.; Thoms, S.
CS Department of Electronics and Electrical Engineering, Nanoelectronics Research Centre, University of Glasgow, Glasgow, G12 8QQ, UK
SO Journal of Vacuum Science & Technology, B: Microelectronics and Nanometer Structures (2001), 19(6), 2494-2498
CODEN: JVTBD9; ISSN: 0734-211X

PB American Institute of Physics
DT Journal
LA English
AB The need for short length T gates with good process control is demanding because pattern **resolution** is required in the lower level of resist. This article considers different resist systems and uses the resist sensitivity ratio between the head and foot defining layers to build two models. These are useful for determining the optimum parameters for T-gate fabrication and associated gate feeds. It is shown that the optimum resist sensitivity ratio is about 6 at 50 kV where bloating is negligible and good footwidth control is obtained. It is also shown that further improvements can be obtained by moving to 100 kV where a sensitivity ratio of 14 can be used. Sensitivity ratios between 6 and 14 can be achieved using either the poly(methylmethacrylate)/UVIII or ZEP520/UVIII bilayers since in both cases the sensitivity ratio can be varied by changing the development times and the bake temps.
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
Section cross-reference(s): 76
ST T gate fabrication resist sensitivity effect electron beam **lithog**
IT Interconnections, electric
(T-gate; effect of resist sensitivity ratio on T-gate fabrication)
IT Electron beam **lithography**
Resists
(effect of resist sensitivity ratio on T-gate fabrication)
IT Transistors
(effect of resist sensitivity ratio on T-gate fabrication in relation to high frequency transistors fabrication)
IT **43127-35-1**, ZEP520
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(ZEP520; effect of **resist** sensitivity ratio on T-gate fabrication)
IT 9011-14-7, Poly(methylmethacrylate) 180513-74-0, UVIII
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(effect of resist sensitivity ratio on T-gate fabrication)
IT **43127-35-1**, ZEP520
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(ZEP520; effect of **resist** sensitivity ratio on T-gate fabrication)
RN 43127-35-1 HCAPLUS
CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

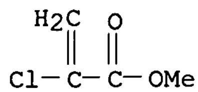
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



RE.CNT 12 THERE ARE 12 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L31 ANSWER 14 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 2001:803959 HCAPLUS
DN 136:61411
TI New advances in resist system for next-generation **lithography**
AU Hu, Yongqi; He, Wei; Gonsalves, Kenneth E.; Merhari, Lhadi
CS University of Connecticut, Storrs, CT, 06269, USA
SO Proceedings of SPIE-The International Society for Optical Engineering (2001), 4345(Pt. 2, Advances in Resist Technology and Processing XVIII), 881-890
CODEN: PSISDG; ISSN: 0277-786X

Same as Microelectronic Engineering.

PB SPIE-The International Society for Optical Engineering
DT Journal
LA English
AB A novel **nanocomposite** resist system was developed for sub-100 nm **resolution** e-beam **lithog.** by dispersing surface-treated silica **nanoparticles** in a com. ZEP 520 resist. At 4.0 wt % loading of silica **nanoparticles**, the system exhibited a much higher **resolution** than ZEP 520 without sacrificing the intrinsic sensitivity and contrast of the starting polymer. The first major result is that 46 nm-wide isolated lines were obtained in the **nanocomposite** system (.apprx. 250 nm thick layer), whereas comparatively 130 nm-wide lines were obtained in ZEP 520 under the same exptl. conditions. Interestingly, this dramatic reduction of line broadening already occurred at 20 keV while higher energy e-beams (up to 100 keV) did not lead to further line broadening reduction Moreover, it was shown that the addition of silica **nanoparticles** resulted in a higher resistance of the **nanocomposite** to plasma etching with O2 gas. Extending the **nanocomposite** approach to the KRS-XE resist led to both enhanced **resolution** and mech. stability. The major **resolution** improvement in both systems indicates that **nanocomposite** systems are promising candidates for sub-100 nm **resolution** e-beam **lithog.** A mechanism, explaining the electron-**nanocomposite** interactions at the origin of line broadening reduction, is proposed and tentatively backed by preliminary Monte Carlo simulations.
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
ST silica **nanoparticle** ZEP520 electron beam **nanocomposite** resist
IT Simulation and Modeling, physicochemical
(Monte Carlo; electron-**nanocomposite** interactions of electron-beam **nanocomposite** resist system containing surface-treated silica **nanoparticles** in ZEP 520 resist)
IT Electron beam resists
(**lithog.** characterization of electron-beam

nanocomposite resist system containing surface-treated silica **nanoparticles** in ZEP 520 or KRS-XE resist)

IT Proximity effect
(**lithog.** characterization of electron-beam **nanocomposite** resist system containing surface-treated silica **nanoparticles** in ZEP520 resist)

IT Etching
(plasma; **lithog.** characterization of electron-beam **nanocomposite** resist system containing surface-treated silica **nanoparticles** in ZEP 520 or KRS-XE resist)

IT **43127-35-1**, ZEP 520
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(ZEP 520; **lithog.** characterization of electron-beam **nanocomposite resist** system containing surface-treated silica **nanoparticles** in ZEP520 **resist**)

IT 302353-92-0, KRS-XE
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(**lithog.** characterization of electron-beam **nanocomposite** resist system containing surface-treated silica **nanoparticles** in KRS-XE resist)

IT 7631-86-9, Silica, properties
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(**lithog.** characterization of electron-beam **nanocomposite** resist system containing surface-treated silica **nanoparticles** in ZEP 520 or KRS-XE resist)

IT 56-23-5, Carbon tetrachloride, uses 7782-44-7, Oxygen, uses
RL: NUU (Other use, unclassified); USES (Uses)
(plasma etch; **lithog.** characterization of electron-beam **nanocomposite** resist system containing surface-treated silica **nanoparticles** in ZEP 520 or KRS-XE resist)

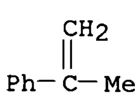
IT **43127-35-1**, ZEP 520
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(ZEP 520; **lithog.** characterization of electron-beam **nanocomposite resist** system containing surface-treated silica **nanoparticles** in ZEP520 **resist**)

RN 43127-35-1 HCAPLUS

CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

CM 1

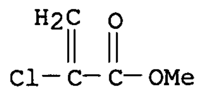
CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7

CMF C4 H5 Cl O2



RE.CNT 9 THERE ARE 9 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L31 ANSWER 15 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 2001:781268 HCAPLUS
DN 135:325267
TI A substrate for and a process in connection with **nanoimprint** lithography
IN Heidari, Babak
PA Obducat Aktiebolag, Swed.
SO PCT Int. Appl., 30 pp.
CODEN: PIXXD2
DT Patent
LA English
FAN.CNT 1

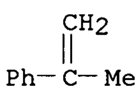
	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2001079933	A1	20011025	WO 2001-SE788	20010410
	W: AE, AG, AL, AM, AT, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, CZ, DE, DE, DK, DK, DM, DZ, EE, EE, ES, FI, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM				
	RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG				
	SE 2000001430	A	20011019	SE 2000-1430	20000418
	SE 516194	C2	20011203		
	EP 1275031	A1	20030115	EP 2001-922176	20010410
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR				
	JP 2004513504	T2	20040430	JP 2001-576539	20010410
	US 2004005444	A1	20040108	US 2003-258027	20030121
PRAI	SE 2000-1430	A	20000418		
	WO 2001-SE788	W	20010410		

AB The invention relates to a substrate comprising at least a 1st and a 2nd coating layer on 1 surface of the substrate, for **nanoimprint** lithog., the 1st coating layer consisting of a pos. resist and the 2nd coating layer consisting of a neg. resist. The invention also relates to a process in connection with **nanoimprint** lithog. on the substrate , a pattern of **nanometer** size being impressed in a 1st stage into the 2nd coating layer by a template , following which the 1st coating layer , in a 2nd stage, is exposed to a chiefly isotropic developing method on surfaces thereof that were exposed in connection with the 1st stage, a method for developing and material for the 1st and 2nd coating layers being selected so that the 1st coating layer is developed more quickly than the 2nd coating layer , so that an undercut profile is obtained in the coating layers.

IC ICM G03F007-00
ICS B41M001-06; B81C001-00
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
ST substrate **nanoimprint** lithog Shipley 1800 aluminum poly methyl methacrylate
IT Coating materials
Lithography
Resists
(substrate for **nanoimprint** lithog. with resist coating layer containing)
IT 7429-90-5, Aluminum, uses 9011-14-7 **43127-35-1**, ZEP 520
164325-87-5, Microposit S 1800 301822-62-8, SC 100
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(substrate for **nanoimprint** lithog. with **resist** coating layer containing)
IT **43127-35-1**, ZEP 520
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(substrate for **nanoimprint** lithog. with **resist** coating layer containing)
RN 43127-35-1 HCAPLUS
CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

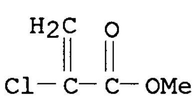
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



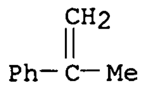
RE.CNT 2 THERE ARE 2 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L31 ANSWER 16 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 2001:626530 HCAPLUS
DN 135:378638
TI **Nanocomposite** resists for electron beam **nanolithography**
AU Hu, Y.; Wu, H.; Gonsalves, K.; Merhari, L.
CS Department of Chemistry & Polymer Program, University of Connecticut,

Institute of Materials Science, Storrs, CT, 06269-3136, USA
SO Microelectronic Engineering (2001), 56(3-4), 289-294
CODEN: MIENEF; ISSN: 0167-9317
PB Elsevier Science B.V.
DT Journal
LA English
AB A novel **nanocomposite** resist system was developed for sub-100 nm **resolution** e-beam **lithog.** by dispersing surface-treated silica **nanoparticles** in a com. ZEP520 resist. At 4.0 wt % loading of silica **nanoparticles,** the system exhibited a much higher **resolution** than ZEP520 without sacrificing the intrinsic high sensitivity and contrast of the starting polymer. The first major result is that 46 nm-wide isolated lines were obtained in the **nanocomposite** system, whereas comparatively 130 nm-wide lines were obtained in ZEP520 under the same exptl. conditions. Moreover, it was shown that the addition of silica **nanoparticles** resulted in a higher resistance of the **nanocomposite** to plasma etching with O2 gas. The major **resolution** improvement indicates that the **nanocomposite** is a promising candidate resist for sub-100 nm **resolution** e-beam **lithog.**
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
ST **nanocomposite** resist electron beam **nanolithog;** silica **nanoparticle** ZEP520 **nanocomposite** resist electron beam **lithog**
IT Proximity effect
(electron-beam **lithog.** characterization of **nanocomposite** resist system containing surface-treated silica **nanoparticles** dispersed in ZEP520)
IT Electron beam resists
(electron-beam **lithog. nanocomposite** resist system containing surface-treated silica **nanoparticles** dispersed in ZEP520)
IT Etching
(plasma; electron-beam **lithog.** characterization of **nanocomposite** resist system containing surface-treated silica **nanoparticles** dispersed in ZEP520)
IT 7631-86-9, Silica, uses **43127-35-1,** ZEP520
RL: TEM (Technical or engineered material use); USES (Uses)
(electron-beam **lithog. nanocomposite resist** system containing surface-treated silica **nanoparticles** dispersed in ZEP520)
IT 75-73-0, Carbon tetrafluoride 7782-44-7, Oxygen, uses
RL: NUU (Other use, unclassified); USES (Uses)
(plasma etch; electron-beam **lithog.** characterization of **nanocomposite** resist system containing surface-treated silica **nanoparticles** dispersed in ZEP520)
IT **43127-35-1,** ZEP520
RL: TEM (Technical or engineered material use); USES (Uses)
(electron-beam **lithog. nanocomposite resist** system containing surface-treated silica **nanoparticles** dispersed in ZEP520)
RN 43127-35-1 HCAPLUS
CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

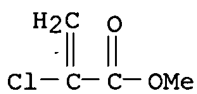
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



RE.CNT 9 THERE ARE 9 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L31 ANSWER 17 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 2001:546591 HCAPLUS
DN 135:280377
TI Fullerene **nanocomposite** resist for **nanolithography**
AU Ishii, Tetsuyoshi; Yokoo, Atsushi; Murata, Yuka; Shigehara, Kiyotaka
CS NTT Photonics Laboratories, Kanagawa, 243-0198, Japan
SO Materials Research Society Symposium Proceedings (2001), 636(Nonlithographic and Lithographic Methods of Nanofabrication: From Ultralarge-Scale Integration to Photonics to Molecular Electronics), D6.4/1-D6.4/12
CODEN: MRSPDH; ISSN: 0272-9172
PB Materials Research Society
DT Journal
LA English
AB Fullerene **nanocomposite** resist is proposed for **nanolithog**. A resist system composed of fullerene (C60, C70 or their mixture) and a pos.-type electron beam resist, ZEP 520, exhibits a substantial increase in resistance that gives rise to improved **resolution** by resist thinning. This has been demonstrated through the fabrication of a 15-nm gate pattern by using a film thinner than that needed for the virgin ZEP resist. The sensitivity of the fullerene-ZEP **nanocomposite** readily changes with the fullerene content due to the dissoln.-inhibiting effect of fullerene, and this unique characteristic can be employed to construct a fullerene-incorporated bilayer resist system for lift-off. Since chemical modified fullerene derivs. are expected to have better solubility in casting solvent and better miscibility with ZEP, it is possible to prepare the corresponding **nanocomposites** with a large amount of fullerene derivative, up to 50 wt%, with a minimal decrease of sensitivity and without losing the potential **resolution** improvement and moderate enhancement of dry-etching resistance. A chemical amplified **nanocomposite** resist made of a fullerene derivative and a chemical amplification resist, ZCA 200, is briefly examined in relation to the sensitivity increase.
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other

Reprographic Processes)
Section cross-reference(s): 76

ST fullerene **nanocomposite** resist electron beam **nanolithog**

IT Electron beam resists
(**lithog.** characterization of **nanocomposite** resist system containing fullerene and ZEP 520)

IT 363134-88-7, ZCA 200
RL: TEM (Technical or engineered material use); USES (Uses)
(chemical amplified **nanocomposite** resist system containing fullerene and ZCA200)

IT 75-59-2, Tetramethylammonium hydroxide 628-63-7, ZED-N 50
RL: NUU (Other use, unclassified); USES (Uses)
(developer; **lithog.** characterization of **nanocomposite** resist system containing fullerene and ZEP 520)

IT 409-21-2, Silicon carbide(SiC), uses 7440-02-0, Nickel, uses 7440-21-3, Silicon, uses
RL: NUU (Other use, unclassified); USES (Uses)
(**lithog.** characterization of bilayer resist system containing fullerene and ZEP 520)

IT **43127-35-1**, ZEP 520 99685-96-8, C60 Fullerene 115383-22-7, C70 Fullerene 318958-79-1 354149-84-1 362685-08-3 362685-09-4
RL: TEM (Technical or engineered material use); USES (Uses)
(**lithog.** characterization of **nanocomposite resist** system containing fullerene and ZEP 520)

IT 76-16-4, Hexafluoroethane
RL: NUU (Other use, unclassified); USES (Uses)
(reactive ion etching plasma; **lithog.** characterization of bilayer resist system containing fullerene and ZEP 520)

IT 872-50-4, N-Methylpyrrolidone, uses
RL: NUU (Other use, unclassified); USES (Uses)
(resist remover; **lithog.** characterization of bilayer resist system containing fullerene and ZEP 520)

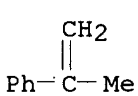
IT **43127-35-1**, ZEP 520
RL: TEM (Technical or engineered material use); USES (Uses)
(**lithog.** characterization of **nanocomposite resist** system containing fullerene and ZEP 520)

RN 43127-35-1 HCAPLUS

CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

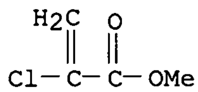
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



RE.CNT 16 THERE ARE 16 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L31 ANSWER 18 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 2001:546589 HCAPLUS
DN 135:280376
TI High **resolution** resists for next generation **lithography** : the **nanocomposite** approach
AU Gonsalves, Kenneth E.; Wu, Hengpeng; Hu, Yongqi; Merhari, Lhadi
CS Polymer Program at the Institute of Materials Science & Department of Chemistry, University of Connecticut, Storrs, CT, 06268, USA
SO Materials Research Society Symposium Proceedings (2001), 636(Nonlithographic and Lithographic Methods of Nanofabrication: From Ultralarge-Scale Integration to Photonics to Molecular Electronics), D6.5/1-D6.5/12
CODEN: MRSPDH; ISSN: 0272-9172

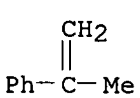
11/27-12/1/2000 (2000 Fall Meeting Proceedings)

PB Materials Research Society
DT Journal
LA English
AB Except for ion-beam **lithog.**, deep-UV (DUV), x-ray, and in particular electron-beam **lithog.** suffer significantly from proximity effects, leading to severe degradation of **resolution** in classical resists. The authors report a new class of resists based on organic/inorg. **nanocomposites** having a structure that reduces the proximity effects. Synthetic routes are described for a ZEP520/ **nano**-SiO_2 resist where 47 nm wide lines have been written with a 40 nm diameter, 20 keV electron beam at no sensitivity cost. Other resist systems based on polyhedral oligosilsesquioxane copolymd. with Me methacrylate, tert-Bu methacrylate, methacrylic acid and a proprietary photoacid generator are also presented. These **nanocomposite** resists suitable for DUV and electron beam **lithog.** show enhancement in both contrast and RIE resistance in oxygen. Tentative mechanisms responsible for proximity effect reduction are also discussed.
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
ST silica **nanoparticle** modified ZEP520 **lithog** resist proximity effect redn; org inorg **nanocomposite lithog** resist proximity effect redn; silsesquioxane methacrylate polymer **lithog** resist proximity effect redn
IT Sputtering
(etching, reactive; **lithog.** resists with improved reactive ion etching resistance from methacrylate copolymers containing oligosilsesquioxane pendant)
IT Silsesquioxanes
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(**lithog.** resists with improved reactive ion etching resistance from methacrylate copolymers containing oligosilsesquioxane pendant)
IT Hybrid organic-inorganic materials
Proximity effect
(organic/inorg. **nanocomposite lithog.** resist with reduced proximity effect)

IT Electron beam resists
Resists
(silica **nanoparticle**-modified ZEP520 **nanocomposite lithog.** resist with reduced proximity effect)
IT Etching
(sputter, reactive; **lithog.** resists with improved reactive ion etching resistance from methacrylate copolymers containing oligosilsesquioxane pendant)
IT **43127-35-1**, ZEP520
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(ZEP520; silica **nanoparticle**-modified ZEP520 **nanocomposite lithog. resist** with reduced proximity effect)
IT 352455-54-0D, polymers 359408-40-5 362675-17-0
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(**lithog.** resists with improved reactive ion etching resistance from methacrylate copolymers containing oligosilsesquioxane pendant)
IT 75-73-0, Carbon tetrafluoride 7782-44-7, Oxygen, uses
RL: NUU (Other use, unclassified); USES (Uses)
(plasma; **lithog.** resists with improved reactive ion etching resistance from methacrylate copolymers containing oligosilsesquioxane pendant)
IT 7631-86-9, Silica, properties
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(silica **nanoparticle**-modified ZEP520 **nanocomposite lithog.** resist with reduced proximity effect)
IT **43127-35-1**, ZEP520
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(ZEP520; silica **nanoparticle**-modified ZEP520 **nanocomposite lithog. resist** with reduced proximity effect)
RN 43127-35-1 HCAPLUS
CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

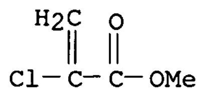
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



RE.CNT 12 THERE ARE 12 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L31 ANSWER 19 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 2001:401443 HCAPLUS
DN 135:172926
TI Contrast enhancement of ZEP 520 resist by fullerene-derivative incorporation
AU Ishii, Tetsuyoshi; Murata, Yuka; Shigehara, Kiyotaka
CS NTT Photonics Laboratories, Kanagawa, 243-0198, Japan
SO Japanese Journal of Applied Physics, Part 2: Letters (2001), 40(5A), L478-L480
CODEN: JAPLD8; ISSN: 0021-4922
PB Japan Society of Applied Physics
DT Journal
LA English
AB A fullerene-derivative **nanocomposite** resist system based on a pos.-type electron-beam resist, ZEP 520, is examined for contrast enhancement. The system containing 10 wt% of the derivative shows a substantially enhanced γ-value of 22.9, which is about three-and-a-half times higher than that of a virgin ZEP resist, and exhibits a very-high-contrast 50 nm pattern in an ultrathin film of 150 nm. Etching resistance is also enhanced and the derivative seems to be as effective as C60 in terms of the number of mols. incorporated. The contrast enhancement by fullerene-derivative incorporation has the potential to further improve the **resolution** of ZEP and will extend its application in **nanolithog.**
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
ST electron beam resist fullerene deriv incorporation **lithog** contrast enhancement
IT Electron beam **lithography**
(contrast enhancement of ZEP 520 resist by fullerene-derivative incorporation)
IT Etching
(contrast enhancement of ZEP 520 resist by fullerene-derivative incorporation in relation to etching resistance)
IT Electron beam resists
(pos.-working; contrast enhancement of ZEP 520 resist by fullerene-derivative incorporation)
IT 628-63-7, ZED-N 50
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(ZED-N 50, developer; contrast enhancement of ZEP 520 resist by fullerene-derivative incorporation)
IT **43127-35-1**, ZEP 520
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(contrast enhancement of ZEP 520 **resist** by fullerene-derivative incorporation)
IT 354149-84-1
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)

(fullerene derivative; contrast enhancement of ZEP 520 resist by fullerene-derivative incorporation)

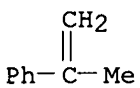
IT **43127-35-1**, ZEP 520
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(contrast enhancement of ZEP 520 **resist** by fullerene-derivative incorporation)

RN 43127-35-1 HCAPLUS

CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

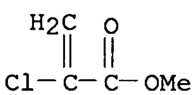
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



RE.CNT 7 THERE ARE 7 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L31 ANSWER 20 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 2001:59331 HCAPLUS

DN 134:273433

TI A 100-kV, 100-A/cm2 electron optical system for the EB-X3 X-ray mask writer

AU Saito, Kenichi; Kato, Junichi; Matsuda, Tadahito; Nakayama, Yoshinori

CS NTT Telecommunications Energy Laboratories, Kanagawa, 243-0198, Japan

SO Japanese Journal of Applied Physics, Part 1: Regular Papers, Short Notes & Review Papers (2000), 39(12B), 6849-6853
CODEN: JAPNDE; ISSN: 0021-4922

PB Japan Society of Applied Physics

DT Journal

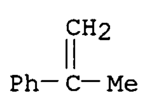
LA English

AB In order to increase the throughput of the EB-X3 variably shaped electron beam writing system, a method of increasing the c.d. with a zoom lens was introduced into the electron optical system. The electron optical characteristics were measured at current densities of 50 and 100 A/cm2 under various zoom-lens conditions, and the results show that this method can increase the c.d. to 100 A/cm2 without any change in the major electron optical characteristics. At this c.d., the patterning **resolution** was estimated to be 55 nm, and no melting of the first shaping

aperture and no microdischarges in the 100-kV electron gun were observed This confirms that the c.d. of the EB-X3 can in fact be extended to 100 A/cm2 for the fabrication of X-ray masks with a min. feature size of 100 nm and below.
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
ST electron beam writing system x ray mask fabrication **lithog**
IT X-ray masks
(100-kV, 100-A/cm2 electron optical system for electron beam X-ray mask fabrication)
IT X-ray **lithography**
(submicron; 100-kV, 100-A/cm2 electron optical system for electron beam X-ray mask fabrication in relation to)
IT **43127-35-1**, ZEP 520
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(ZEP 520; 100-kV, 100-A/cm2 electron optical system for electron beam X-ray mask writer and patterning **resolution** using **resist**
)
IT **43127-35-1**, ZEP 520
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(ZEP 520; 100-kV, 100-A/cm2 electron optical system for electron beam X-ray mask writer and patterning **resolution** using **resist**
)
RN 43127-35-1 HCAPLUS
CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

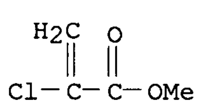
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



RE.CNT 13 THERE ARE 13 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L31 ANSWER 21 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 2000:777085 HCAPLUS
DN 134:107881

TI Fullerene-derivative **nanocomposite** resist for **nanometer**
pattern fabrication
AU Ishii, Tetsuyoshi; Tamamura, Toshiaki; Shigehara, Kiyotaka
CS NTT Basic Research Laboratories, Kanagawa, 243-0198, Japan
SO Japanese Journal of Applied Physics, Part 2: Letters (2000), 39(10B),
L1068-L1070
CODEN: JAPLD8; ISSN: 0021-4922
PB Japan Society of Applied Physics
DT Journal
LA English
AB A **nanocomposite** resist system that incorporates a fullerene
derivative into a conventional pos.-type electron-beam resist, ZEP520, is
examined Because of the enhanced solubility of the derivative, the system
exhibits a
minimal decrease of sensitivity even at an incorporation content of 50 wt%
and enables the fabrication of 50 nm patterns with a line dose of 0.39
nC/cm. At higher contents, however, the derivative is not as effective as
fullerene C60 or C70 in improving dry-etching resistance because of the
aggregation of the derivative mols., which is probably due to the uniqueness
of the derivative used and will be avoided by appropriate mol. design.
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other
Reprographic Processes)
ST electron beam lithog **nanocomposite** resist system ZEP520
fullerene deriv
IT Electron beam resists
(electron-beam lithog. characteristics of **nanocomposite**
resist containing ZEP520 matrix resist and C60 fullerene derivative)
IT Etching kinetics
(reactive ion; electron-beam lithog. characteristics of
nanocomposite resist containing ZEP520 matrix resist and C60
fullerene derivative)
IT **43127-35-1**, ZEP520
RL: PRP (Properties); TEM (Technical or engineered material use); USES
(Uses)
(ZEP520; electron-beam lithog. characteristics of **nanocomposite**
resist containing ZEP520 matrix **resist** and C60 fullerene
derivative)
IT 99685-96-8, C60 Fullerene 115383-22-7, C70 Fullerene
RL: NUU (Other use, unclassified); USES (Uses)
(comparative system; electron-beam lithog. characteristics of
nanocomposite resist containing ZEP520 matrix resist and C60
fullerene derivative)
IT 628-63-7, Amyl acetate
RL: NUU (Other use, unclassified); USES (Uses)
(developer; electron-beam lithog. characteristics of
nanocomposite resist containing ZEP520 matrix resist and C60
fullerene derivative)
IT 318958-79-1
RL: PRP (Properties); TEM (Technical or engineered material use); USES
(Uses)
(electron-beam lithog. characteristics of **nanocomposite**
resist containing ZEP520 matrix resist and C60 fullerene derivative)
IT 76-16-4, Hexafluoroethane
RL: NUU (Other use, unclassified); USES (Uses)
(etching agent; electron-beam lithog. characteristics of
nanocomposite resist containing ZEP520 matrix resist and C60
fullerene derivative)
IT **43127-35-1**, ZEP520

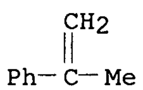
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(ZEP520; electron-beam lithog. characteristics of **nanocomposite resist** containing ZEP520 matrix **resist** and C60 fullerene derivative)

RN 43127-35-1 HCAPLUS

CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

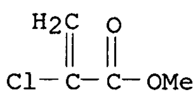
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



RE.CNT 7 THERE ARE 7 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L31 ANSWER 22 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 2000:610114 HCAPLUS

DN 133:303389

TI Resist materials providing small line-edge roughness

AU Namatsu, Hideo; Yamaguchi, Toru; Kurihara, Kenji

CS NTT Basic Research Laboratories, Kanagawa, 243-0198, Japan

SO Materials Research Society Symposium Proceedings (2000), 584(Materials Issues and Modeling for Device Nanofabrication), 135-146
CODEN: MRSPDH; ISSN: 0272-9172

PB Materials Research Society

DT Journal

LA English

AB Our research focuses on the line-edge roughness of resist patterns and how to reduce it in order to establish **nanolithog.** as a practical tool. Com. available e-beam resists exhibit a line-edge roughness of 3 nm (σ) or more. It is caused mainly by polymer aggregates in the resist. During development, they are extracted through dissoln. of the surrounding polymer matrix. That is, the aggregates themselves dissolve more slowly than the surrounding matrix; and those that remain embedded in the resist produce line-edge roughness. To reduce the roughness, the effect of the aggregates must be suppressed. One way of doing this is to use a resist containing small aggregates. A good candidate is hydrogen silsesquioxane, which has a three-dimensional framework. Another way is

to use a resist in which the aggregates are linked together, which makes them difficult to extract during development. A good example is an acrylate-type resist with a crosslinker mixed in.

CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
Section cross-reference(s): 38

ST electron beam resist line edge roughness

IT Polymers, properties
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(aggregates; resist materials providing small line-edge roughness)

IT Silsesquioxanes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(hydrogen; resist materials providing small line-edge roughness)

IT Extraction
(of polymer aggregates; resist materials providing small line-edge roughness)

IT Aggregates
(polymeric, extraction; resist materials providing small line-edge roughness)

IT Crosslinking
Electron beam resists
(resist materials providing small line-edge roughness)

IT Lithography
(submicron; resist materials providing small line-edge roughness)

IT 1456-53-7
RL: NUU (Other use, unclassified); USES (Uses)
(crosslinker; resist materials providing small line-edge roughness)

IT 9011-14-7, PMMA **43127-35-1**, ZEP520 119574-53-7, SAL-601
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**resist** materials providing small line-edge roughness)

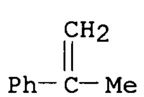
IT **43127-35-1**, ZEP520
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**resist** materials providing small line-edge roughness)

RN 43127-35-1 HCAPLUS

CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

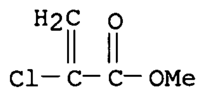
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



RE.CNT 10 THERE ARE 10 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L31 ANSWER 23 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 2000:610110 HCAPLUS
DN 133:303388
TI Fullerene-incorporated **nanocomposite** resist system for **nanolithography**
AU Ishii, T.; Nozawa, H.; Euramochi, E.; Tamamura, T.
CS NTT Basic Research Laboratories, Kanagawa, Japan
SO Materials Research Society Symposium Proceedings (2000), 584(Materials Issues and Modeling for Device Nanofabrication), 103-115
CODEN: MRSPDH; ISSN: 0272-9172
PB Materials Research Society
DT Journal
LA English
AB A **nanocomposite** resist system that incorporates sub-nm fullerene mols. (C60 and/or C70) into a conventional resist material is proposed for **nanolithog**. Fullerene has phys. and chemical resistant characteristics, and its incorporation reinforces the original resist film, leading to substantial improvements in resist performance: etching resistance, pattern contrast, mech. strength and thermal resistance. We have prepared a system composed of a pos.-type electron beam resist, ZEP520, and C60 or a C60/C70 mixture and through the fabrication of high electron mobility transistors (HEMTs), X-ray masks, and groove-grating mirrors for lasers with **nanometer** dimensions confirmed improved resist performance, particularly **resolution** improvements due to enhanced etching resistance. By making use of a characteristics unique to the **nanocomposite**, which is that sensitivity readily changes with the fullerene content due to a dissoln. inhibiting effect of fullerene, we have constructed a fullerene-incorporated bilayer resist system for a lift-off process and have successfully fabricated a highly-ordered array of self-organized boxlike **nanostructures** and a mold for **nanoprinting**. Further, solubility enhancement by fullerene derivs. has been examined for a higher degree of fullerene incorporation and better sensitivity characteristics in future **nanocomposite** resist systems.
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
Section cross-reference(s): 73, 76
ST fullerene **nanocomposite** electron beam resist **nanolithog**
IT Etching
(dry, resistance; fullerene-incorporated **nanocomposite** resist system for **nanolithog**.)
IT Diffraction gratings
Laser mirrors
Nanocomposites
Nanoparticles
Porosity
Semiconductor device fabrication
Strength
Thermal resistance

X-ray masks
(fullerene-incorporated **nanocomposite** resist system for **nanolithog.**)

IT Fullerenes
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(fullerene-incorporated **nanocomposite** resist system for **nanolithog.**)

IT Dissolution
(inhibitors; fullerene-incorporated **nanocomposite** resist system for **nanolithog.**)

IT Solubility
(of fullerenes; fullerene-incorporated **nanocomposite** resist system for **nanolithog.**)

IT Electron beam resists
(pos.; fullerene-incorporated **nanocomposite** resist system for **nanolithog.**)

IT Etching
(resistance; fullerene-incorporated **nanocomposite** resist system for **nanolithog.**)

IT **Lithography**
(submicron; fullerene-incorporated **nanocomposite** resist system for **nanolithog.**)

IT 76-16-4, Hexafluoroethane 77-92-9, Citric acid, processes 7722-84-1, Hydrogen peroxide, processes 7782-50-5, Chlorine, processes
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(etchant; fullerene-incorporated **nanocomposite** resist system for **nanolithog.**)

IT **43127-35-1**, ZEP520 99685-96-8, Fullerene C60 115383-22-7, Fullerene C70
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(fullerene-incorporated **nanocomposite resist** system for **nanolithog.**)

IT 95-50-1, o-Dichlorobenzene
RL: NUU (Other use, unclassified); USES (Uses)
(solvent; fullerene-incorporated **nanocomposite** resist system for **nanolithog.**)

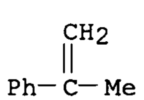
IT **43127-35-1**, ZEP520
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(fullerene-incorporated **nanocomposite resist** system for **nanolithog.**)

RN 43127-35-1 HCAPLUS

CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

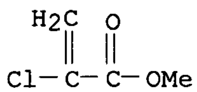
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



RE.CNT 25 THERE ARE 25 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L31 ANSWER 24 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 2000:89551 HCAPLUS
DN 132:130035
TI Resist pattern formation and manufacture of semiconductor devices
IN Kon, Junichi; Yano, Akira; Watanabe, Keiji; Namiki, Takahisa; Nozaki, Koji; Igarashi, Miwa; Tan, Takahiro; Makiyama, Kozo; Nihei, Mizuhisa
PA Fujitsu Ltd., Japan; Fujitsu Kantamu Device K. K.
SO Jpn. Kokai Tokkyo Koho, 13 pp.
CODEN: JKXXAF
DT Patent
LA Japanese
FAN.CNT 1

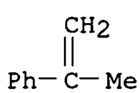
	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 2000039717	A2	20000208	JP 1998-209711	19980724
PRAI	JP 1998-209711		19980724		

AB The resist pattern is formed by (1) coating a resist containing (MeCPhCH2)m[ClC(CO2Me)CH2]n (m, n = 10-10,000) on a substrate, (2) irradiating an energy ray on the resist layer, and (3) developing the resist by a developer containing C6H5CO2R (I; R = C10-5 alkyl). The resist pattern is formed by (1) forming a 1st electron-beam resist layer on a substrate, (2) forming an alkali-soluble layer on the resist layer, (3) forming 2nd electron-beam resist on the alkali-soluble layer, (4) irradiating an energy ray for 2nd resist layer exposure, and (5) developing the 2nd resist layer by the developer containing I. The semiconductor device is manufactured by (1) successively forming 1st electron-beam resist layer, an alkali-soluble resin layer, and 2nd electron-beam resist layer on a substrate having a channel area connected with a current input-output area, (2) exposing the 2nd resist layer with an energy beam with width W1 crossing the channel area, (3) exposing the 1st resist layer with an energy beam with width W2 (W2 < W1), (4) developing the 2nd resist layer with 1st developer containing I, (5) removing the alkali-soluble resin layer at area
from
which the 2nd resist layer is removed, and (6) developing the 1st resist layer with 2nd developer. The resist shows high electron-beam sensitivity and **lithog**. process using the laminated resist layer shows high **resolution**
IC ICM G03F007-039
ICS G03F007-32; H01L021-027
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
Section cross-reference(s): 76
ST electron beam resist styrene acrylic copolymer; developer benzoate resist

pattern formation; semiconductor device manuf **lithog** resist
IT Electron beam resists
Semiconductor device fabrication
(electron-beam resist pattern formation and manufacture of semiconductor device)
IT **Lithography**
(**lithog.** using laminated electron beam resist layers for manufacture of semiconductor device)
IT **43127-35-1,** Methyl α-chloroacrylate-α-methylstyrene copolymer
RL: TEM (Technical or engineered material use); USES (Uses)
(electron-beam **resist** pattern formation and manufacture of semiconductor device)
IT 93-89-0, Ethyl benzoate
RL: TEM (Technical or engineered material use); USES (Uses)
(resist developer; electron-beam resist pattern formation and manufacture of semiconductor device)
IT 78-93-3, Methyl ethyl ketone, uses 108-10-1, Isobutyl methyl ketone
RL: TEM (Technical or engineered material use); USES (Uses)
(rinsing solution; electron-beam resist pattern formation and manufacture of semiconductor device)
IT **43127-35-1,** Methyl α-chloroacrylate-α-methylstyrene copolymer
RL: TEM (Technical or engineered material use); USES (Uses)
(electron-beam **resist** pattern formation and manufacture of semiconductor device)
RN 43127-35-1 HCAPLUS
CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

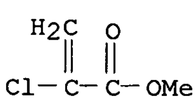
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



L31 ANSWER 25 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 1999:771349 HCAPLUS
DN 132:258034
TI **Nanometric** aperture arrays fabricated by wet and dry etching of

silicon for near-field optical storage application
AU Lee, M. B.; Atoda, N.; Tsutsui, K.; Ohtsu, M.
CS Advanced Optical Memory Group, National Institute for Advanced Interdisciplinary Research, Tsukuba, Ibaraki, 305-8562, Japan
SO Journal of Vacuum Science & Technology, B: Microelectronics and Nanometer Structures (1999), 17(6), 2462-2466
CODEN: JVTBD9; ISSN: 0734-211X
PB American Institute of Physics
DT Journal
LA English
AB The authors fabricated **nanometric** aperture arrays in order to apply to an optical probe in high-d. near-field optical storage for increase of data-transmission rate. The aperture arrays were fabricated by forming concave pyramidal grooves on a silicon-on-insulator wafer with electron beam lithog. and wet anisotropic etching. Modification of the apex shape of the grooves by re-oxidation and subsequent reactive ion dry etching was able to increase the uniformity of the aperture size remarkably. The light transmission efficiency of the fabricated apertures was measured to be .apprx.10-3 when the aperture size was 100 nm, which was higher than that of a conventional optical fiber probe by several orders of magnitude.
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
ST silicon etching near field optical probe array fabrication recording; electron beam lithog silicon aperture array near field probe
IT Sputtering
(etching, ion-beam, reactive; **nanometer** aperture arrays fabrication by electron-beam lithog. and wet and dry etching of silicon for application as near-field optical probe for optical data storage)
IT Electron beam lithography
Etching
(**nanometer** aperture arrays fabrication by electron-beam lithog. and wet and dry etching of silicon for application as near-field optical probe for optical data storage)
IT Optical recording
(near-field; **nanometer** aperture arrays fabrication by electron-beam lithog. and wet and dry etching of silicon for application as near-field optical probe for optical data storage)
IT Etching
(sputter, ion-beam, reactive; **nanometer** aperture arrays fabrication by electron-beam lithog. and wet and dry etching of silicon for application as near-field optical probe for optical data storage)
IT **43127-35-1**, ZEP-520
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(electron-beam **resist** ZEP-520; **nanometer** aperture arrays fabrication by electron-beam lithog. and wet and dry etching of silicon for application as near-field optical probe for optical data storage)
IT 1310-58-3, Potassium hydroxide, processes 7664-39-3, Hydrofluoric acid, processes
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(etching agent; **nanometer** aperture arrays fabrication by electron-beam lithog. and wet and dry etching of silicon for application as near-field optical probe for optical data storage)
IT 7440-21-3, Silicon, processes
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(**nanometer** aperture arrays fabrication by electron-beam

lithog. and wet and dry etching of silicon for application as
near-field optical probe for optical data storage)

IT 7631-86-9, Silica, processes
RL: FMU (Formation, unclassified); PEP (Physical, engineering or chemical process); FORM (Formation, nonpreparative); PROC (Process)
(**nanometer** aperture arrays fabrication by electron-beam lithog. and wet and dry etching of silicon for application as near-field optical probe for optical data storage)

IT 7782-44-7, Oxygen, processes
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(**nanometer** aperture arrays fabrication by electron-beam lithog. and wet and dry etching of silicon for application as near-field optical probe for optical data storage)

IT 143928-59-0, OFPR-8600
RL: NUU (Other use, unclassified); USES (Uses)
(photoresist OFPR-8600; **nanometer** aperture arrays fabrication by electron-beam lithog. and wet and dry etching of silicon for application as near-field optical probe for optical data storage)

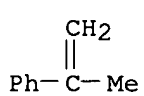
IT 75-73-0, Carbon tetrafluoride
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(reactive ion etching; **nanometer** aperture arrays fabrication by electron-beam lithog. and wet and dry etching of silicon for application as near-field optical probe for optical data storage)

IT **43127-35-1**, ZEP-520
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(electron-beam **resist** ZEP-520; **nanometer** aperture arrays fabrication by electron-beam lithog. and wet and dry etching of silicon for application as near-field optical probe for optical data storage)

RN 43127-35-1 HCAPLUS
CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

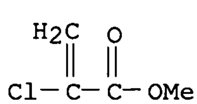
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



RE.CNT 13 THERE ARE 13 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L31 ANSWER 26 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 1998:720642 HCAPLUS
DN 130:58978
TI Fullerene incorporated **nanocomposite** resist systems for practical **nanofabrication**
AU Ishii, Tetsuyoshi; Shibata, Tomohiro; Nozawa, Hiroshi; Tamamura, Toshiaki
CS NTT Opto-electronics Laboratories, Kanagawa, Japan
SO AIP Conference Proceedings (1998), 442(Electronic Properties of Novel Materials--Progress in Molecular Nanostructures), 494-498
CODEN: APCPCS; ISSN: 0094-243X
PB American Institute of Physics
DT Journal
LA English
AB The authors propose a **nanocomposite** resist system that incorporates sub-nm fullerene C60 or C70 into a conventional resist material as a practical **nanometer** range resist system. Incorporation of fullerenes reinforces the original resist film, leading to substantial improvements in resist performance: etching resistance, pattern contrast, mech. strength, and thermal resistance. A **nanocomposite** resist system containing pos.-type electron beam resist ZEP520 and C60/C70 mixture was used to fabricate x-ray masks, diffractive grating elements, **nanoprinting** molds, and quantum dots.
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
Section cross-reference(s): 73
ST lithog **nanocomposite** resist material fullerene
IT X-ray masks
(fabrication of mask for x-ray lithog. using **nanocomposite** resist system containing fullerene C60/C70 mixture and electron-beam resist ZEP520)
IT Semiconductor lasers
(lithog. fabrication of grating patterns for semiconductor laser using **nanocomposite** resist system containing fullerene C60/C70 mixture and electron-beam resist ZEP520)
IT Quantum dot devices
(lithog. fabrication of quantum dots using **nanocomposite** resist system containing fullerene C60/C70 mixture and electron-beam resist ZEP520)
IT Fullerenes
RL: TEM (Technical or engineered material use); USES (Uses)
(lithog. **nanocomposite** resist system containing fullerene C60/C70 mixture and electron-beam resist ZEP520)
IT Electron beam resists
Resists
(**nanocomposite** resist system containing fullerene C60/C70 mixture and electron-beam resist ZEP520)
IT **43127-35-1**, ZEP520
RL: TEM (Technical or engineered material use); USES (Uses)
(ZEP520; **nanocomposite resist** system containing fullerene C60/C70 mixture and electron-beam **resist** ZEP520)
IT 99685-96-8, C60 Fullerene 115383-22-7, C70 Fullerene
RL: TEM (Technical or engineered material use); USES (Uses)
(**nanocomposite** resist system containing fullerene C60/C70 mixture and electron-beam resist ZEP520)
IT **43127-35-1**, ZEP520
RL: TEM (Technical or engineered material use); USES (Uses)
(ZEP520; **nanocomposite resist** system containing

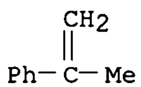
fullerene C60/C70 mixture and electron-beam **resist** ZEP520)

RN 43127-35-1 HCAPLUS

CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

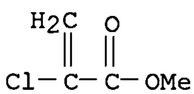
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



RE.CNT 8 THERE ARE 8 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L31 ANSWER 27 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 1998:558927 HCAPLUS
DN 129:195805
TI Development of electron-beam resist and perfluorocarbon rinsing solution used in the process
IN Tamamura, Toshiaki; Ishii, Tetsuyoshi
PA Nippon Telegraph and Telephone Corp., Japan
SO Jpn. Kokai Tokkyo Koho, 4 pp.
CODEN: JKXXAF
DT Patent
LA Japanese
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 10228117	A2	19980825	JP 1997-30874	19970214
PRAI	JP 1997-30874		19970214		

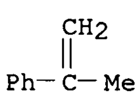
AB In the title process involving the steps of developing an exposed resist with a developing solvent, rinsing the solvent with ≥1 kinds of rinsing solns., and drying the resist, a α-chloromethacrylate-α-methylstyrene copolymer-based resist or its **nano** -composite resist is employed and a perfluorocarbon-type solvent is used at least as the rinsing solution used finally in the rinsing step. A rinsing solution is also claimed, which is used for the above resist and comprises perfluorocarbon-type solvents. High resolution patterns with good profile are obtained.

IC ICM G03F007-30
ICS G03F007-027; G03F007-32; H01L021-027

CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other
Reprographic Processes)
ST electron beam resist chloromethacrylate methylstyrene copolymer;
perfluorocarbon rinsing soln resist; **nanocomposite** resist
fullerene
IT Electron beam resists
(chloromethacrylate-methylstyrene copolymer resist composition and rinsing
solution containing perfluorocarbons)
IT Perfluorocarbons
RL: NUU (Other use, unclassified); USES (Uses)
(chloromethacrylate-methylstyrene copolymer resist composition and rinsing
solution containing perfluorocarbons)
IT 99685-96-8, [5,6]Fullerene-C60-Ih
RL: MOA (Modifier or additive use); TEM (Technical or engineered material
use); USES (Uses)
(chloromethacrylate-methylstyrene copolymer containing fullerene for
nanocmoposite resist composition and rinsing solution)
IT 335-57-9, Perfluoroheptane 355-42-0, Perfluorohexane 678-26-2,
Perfluoropentane
RL: NUU (Other use, unclassified); USES (Uses)
(chloromethacrylate-methylstyrene copolymer resist composition and rinsing
solution containing perfluorocarbons)
IT **43127-35-1**, ZEP 520
RL: TEM (Technical or engineered material use); USES (Uses)
(chloromethacrylate-methylstyrene copolymer **resist** composition and
rinsing solution containing perfluorocarbons)
IT **43127-35-1**, ZEP 520
RL: TEM (Technical or engineered material use); USES (Uses)
(chloromethacrylate-methylstyrene copolymer **resist** composition and
rinsing solution containing perfluorocarbons)
RN 43127-35-1 HCAPLUS
CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with
(1-methylethenyl)benzene (9CI) (CA INDEX NAME)

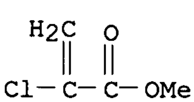
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2

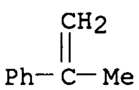


L31 ANSWER 28 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 1998:66818 HCAPLUS
DN 128:134282
TI Novel proximity effect including pattern-dependent resist development in electron beam **nanolithography**
AU Yamazaki, Kenji; Kurihara, Kenji; Yamaguchi, Toru; Namatsu, Hideo; Nagase, Masao
CS NTT Basic Res. Lab., Atsugi, 243-01, Japan
SO Japanese Journal of Applied Physics, Part 1: Regular Papers, Short Notes & Review Papers (1997), 36(12B), 7552-7556
CODEN: JAPNDE; ISSN: 0021-4922
PB Japanese Journal of Applied Physics
DT Journal
LA English
AB A novel proximity effect, which includes the effect due to secondary electron scattering to a range of less than a micron and the pattern dependence of resist development, was found and studied to develop a precise dose control method in electron beam **nano**-lithog. Expts. and simulations including secondary electron scattering were performed for precise evaluation of the proximity effect. This result revealed that the proximity effect caused by secondary electron scattering to the range between 30 nm and a micron is not negligible for **nano**-patterns. From exptl. estimation of the rate of development of patterns of various sizes, a significant decrease of the rate was found for patterns <30-nm wide. The difference of the rate is also modified by the background deposited energy due to surrounding patterns. Therefore, the authors have to be very careful about how the authors determine the proper dose for a given **nano**-pattern.
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
ST proximity resist development electron beam **nanolithog**
IT Simulation and Modeling, physicochemical
(Monte Carlo; novel proximity effect and pattern-dependent resist development in electron beam **nanolithog.**)
IT Electron beam lithography
Proximity effect
Resists
(novel proximity effect and pattern-dependent resist development in electron beam **nanolithog.**)
IT Conduction electrons
(scattering of; novel proximity effect and pattern-dependent resist development in electron beam **nanolithog.**)
IT 7440-21-3, Silicon, processes 9011-14-7, PMMA
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(novel proximity effect and pattern-dependent resist development in electron beam **nanolithog.**)
IT **43127-35-1**, ZEP520
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(pos. **resist**; novel proximity effect and pattern-dependent **resist** development in electron beam **nanolithog.**)
IT **43127-35-1**, ZEP520
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(pos. **resist**; novel proximity effect and pattern-dependent **resist** development in electron beam **nanolithog.**)
RN 43127-35-1 HCAPLUS

CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

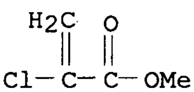
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



RE.CNT 11 THERE ARE 11 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L31 ANSWER 29 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 1997:779684 HCAPLUS
DN 128:121575
TI Ultrasonic and dip resist development processes for 50 nm device fabrication
AU Lee, K. L.; Bucchignano, J.; Gelorme, J.; Viswanathan, R.
CS IBM Research Division, Thomas J. Watson Research Center, Yorktown Heights, NY, 10598, USA
SO Journal of Vacuum Science & Technology, B: Microelectronics and Nanometer Structures (1997), 15(6), 2621-2626
CODEN: JVTBD9; ISSN: 0734-211X
PB American Institute of Physics
DT Journal
LA English
AB A comparison between the conventional dip development process and resist development with ultrasonic agitation at 40 kHz has been conducted for the development of high-resolution resist **nanostructures** with dimension down to 50 nm. High-resolution com. available ZEP520 pos. electron resist and an inhouse epoxy-based neg. resist were used in the study. For large area exposure with ultrasonic agitation for resist development, improved resist sensitivity (≈4%) over a dip development process was observed for pos. resist and no sensitivity improvement was seen with neg. resist. There was also no observable improvement in the measured resist contrast for both pos. and neg. resist with and without ultrasonic agitation. For resist development in dense arrays or isolated **nanostructures**, ultrasonic agitation for pos. and neg. resist development offered faster development rate, more uniformity in resist development and a larger window for exposure dose variation in resist **nanostructures**.
For neg. resist, it was also observed that the descum rate with ultrasonic

agitation was more than a factor of 3 faster than for dip development. Expts. on the relative merits of ultrasonic agitation for resist development with cavitation at 25 kHz and a narrowly focused acoustic beam at 400 kHz indicated that faster development rate and resist contrast were obtained with cavitation for the exptl. conditions used.

CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
Section cross-reference(s): 76

ST ultrasonic dip electron beam resist development

IT Electron beam resists
(ultrasonic and dip development for 50 nm device fabrication)

IT Semiconductor devices
(ultrasonic and dip development of electron beam resist for 50 nm device fabrication)

IT **43127-35-1**, ZEP520
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(electron beam **resist**; ultrasonic and dip development for 50 nm device fabrication)

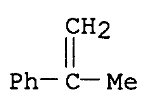
IT **43127-35-1**, ZEP520
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(electron beam **resist**; ultrasonic and dip development for 50 nm device fabrication)

RN 43127-35-1 HCAPLUS

CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

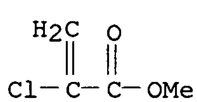
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



RE.CNT 5 THERE ARE 5 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L31 ANSWER 30 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1997:779665 HCAPLUS

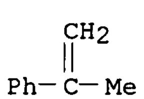
DN 128:121568

TI C60-incorporated **nanocomposite** resist system for practical

nanometer pattern fabrication
AU Ishii, T.; Nozawa, H.; Tamamura, T.; Ozawa, A.
CS NTT Opto-electronics Laboratories, 3-1, Morinosato Wakamiya, Atsugi, Kanagawa, 243-01, Japan
SO Journal of Vacuum Science & Technology, B: Microelectronics and Nanometer Structures (1997), 15(6), 2570-2574
CODEN: JVTBD9; ISSN: 0734-211X
PB American Institute of Physics
DT Journal
LA English
AB We propose a **nanocomposite** resist system that incorporates sub-nm size fullerene C60 mols. into a highly sensitive and moderately dry-etching resistant electron-beam pos. resist, ZEP520. C60 incorporation leads to carbon reinforcement in the original resist material and enhances resist performance for **nanometer** pattern fabrication. 10 wt C60 incorporated ZEP520 shows enhancements of etching resistance (.apprx.15), thermal resistance (.apprx.30 °C), and mech. resistance (3.5-5.5 in the aspect ratio). By applying this new resist system to x-ray mask fabrication, an ultrafine mask with the min. dimension of 45 nm has been successfully fabricated.
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
ST electron beam lithog resist ZEP520 fullerene; x ray photomasks fabrication resist **nanocomposite**
IT Electron beam resists
(lithog. **nanocomposite** resist containing electron-beam pos. resist ZEP520 and fullerene C60)
IT X-ray masks
(lithog. **nanocomposite** resist containing electron-beam pos. resist ZEP520 and fullerene C60 for x-ray masks fabrication)
IT **43127-35-1,** ZEP520 99685-96-8, Carbon C60
RL: TEM (Technical or engineered material use); USES (Uses)
(lithog. **nanocomposite resist** containing electron-beam pos. **resist** ZEP520 and fullerene C60)
IT 7440-25-7, Tantalum, uses 7631-86-9, Silica, uses 12033-89-5, Silicon nitride, uses
RL: NUU (Other use, unclassified); USES (Uses)
(lithog. **nanocomposite** resist containing electron-beam pos. resist ZEP520 and fullerene C60 for x-ray masks fabrication)
IT **43127-35-1,** ZEP520
RL: TEM (Technical or engineered material use); USES (Uses)
(lithog. **nanocomposite resist** containing electron-beam pos. **resist** ZEP520 and fullerene C60)
RN 43127-35-1 HCAPLUS
CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

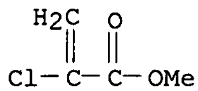
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



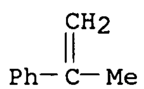
RE.CNT 7 THERE ARE 7 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L31 ANSWER 31 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 1997:689660 HCAPLUS
DN 127:364102
TI **Nanometer**-scale linewidth fluctuations caused by polymer aggregates in resist films
AU Yamaguchi, Toru; Namatsu, Hideo; Nagase, Masao; Yamazaki, Kenji; Kurihara, Kenji
CS NTT Basic Research Laboratories, 3-1 Morinosato Wakamiya, Atsugi-shi, Kanagawa-Pref., 243-01, Japan
SO Applied Physics Letters (1997), 71(16), 2388-2390
CODEN: APPLAB; ISSN: 0003-6951
PB American Institute of Physics
DT Journal
LA English
AB Linewidth fluctuation in resist patterns is a serious problem in electron beam **nanolithog.** We have observed granular structures with a diameter of 20-30 nm in resist films, and have determined that these structures cause the linewidth fluctuations. The granules are made up of polymer aggregates. We discuss the origin of the aggregates from the result that their size depends on the polymer mol. weight We also show that the linewidth fluctuation is reduced, though the developing rate is slow, when the pattern size is less than the aggregate size. The linewidth dependence of the fluctuation and of the developing rate can be explained by the influence of the resist polymer aggregate on the development behavior.
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
ST electron beam lithog resist polymer aggregate
IT Electron beam lithography
(**nanometer**-scale linewidth fluctuations caused by polymer aggregates in ZEP520 resist films)
IT Molecular association
(**nanometer**-scale linewidth fluctuations caused by polymer aggregates in resist films)
IT 67-63-0, 2-Propanol, properties 142-92-7, Hexyl acetate
RL: PRP (Properties)
(developer; **nanometer**-scale linewidth fluctuations caused by polymer aggregates in resist films)
IT **43127-35-1,** ZEP520
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**nanometer**-scale linewidth fluctuations caused by polymer aggregates in **resist** films)

IT **43127-35-1**, ZEP520
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**nanometer**-scale linewidth fluctuations caused by polymer aggregates in **resist** films)
RN 43127-35-1 HCAPLUS
CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

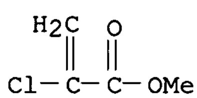
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



RE.CNT 8 THERE ARE 8 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L31 ANSWER 32 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 1997:548486 HCAPLUS
DN 127:285833
TI **Nanometer** table-top proximity x-ray lithography with liquid-target laser-plasma source
AU Malmqvist, L.; Bogdanov, A. L.; Montelius, L.; Hertz, H. M.
CS Department of Physics, Lund Institute of Technology, P.O. Box 118, Lund, S-221 00, Swed.
SO Journal of Vacuum Science & Technology, B: Microelectronics and Nanometer Structures (1997), 15(4), 814-817
CODEN: JVTBD9; ISSN: 0734-211X
PB American Institute of Physics
DT Journal
LA English
AB A compact laser-plasma proximity x-ray lithog. system suitable for laboratory-scale low-volume **nanometer** patterning is presented. The laser-plasma source, which is based on a fluorocarbon liquid-jet target, generates high-brightness λ=1.2-1.7 nm x-ray emission with only negligible debris production The Au/SiNx x-ray mask is fabricated by employing ion milling and a high-contrast e-beam resist. With SAL-601 chemical enhanced resist we demonstrate fabrication of high-aspect-ratio, sub-100 nm structures. The exposure time is currently 20 min using a compact 10 Hz, λ=532 nm, 70 mJ/pulse mode-locked Nd:YAG laser.

However, the regenerative liquid-jet target is designed for operation with future, e.g., 1000 Hz, lasers resulting in projected exposure times of .apprx.10 s.

CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)

ST **nanometer** compact proximity x ray lithog; liq target laser plasma source lithog; fluorocarbon liq jet target laser plasma; electron beam resist x ray mask

IT Electron beam resists
Laser induced plasma
X-ray lithography
X-ray masks
(**nanometer** table-top proximity x-ray lithog. with liquid-target laser-plasma source)

IT 7440-57-5, Gold, uses 12443-21-9
RL: DEV (Device component use); USES (Uses)
(absorber; **nanometer** table-top proximity x-ray lithog. with liquid-target laser-plasma source)

IT 142486-60-0, MF-322
RL: TEM (Technical or engineered material use); USES (Uses)
(developer; **nanometer** table-top proximity x-ray lithog. with liquid-target laser-plasma source)

IT 12033-89-5, Silicon nitride, uses
RL: DEV (Device component use); USES (Uses)
(membrane; **nanometer** table-top proximity x-ray lithog. with liquid-target laser-plasma source)

IT **43127-35-1**, ZEP 520 116765-43-6, Microposit SAL-601ER7
RL: TEM (Technical or engineered material use); USES (Uses)
(**resist; nanometer** table-top proximity x-ray lithog. with liquid-target laser-plasma source)

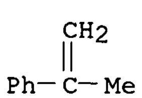
IT **43127-35-1**, ZEP 520
RL: TEM (Technical or engineered material use); USES (Uses)
(**resist; nanometer** table-top proximity x-ray lithog. with liquid-target laser-plasma source)

RN 43127-35-1 HCAPLUS

CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

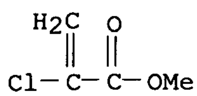
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

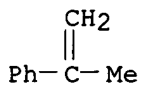
CRN 80-63-7
CMF C4 H5 Cl O2



L31 ANSWER 33 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 1997:471389 HCAPLUS
DN 127:255175
TI C60-incorporated **nanocomposite** resist system
AU Ishii, T.; Nozawa, H.; Tamamura, T.
CS NTT Opto-electronics Laboratories, Atsugi, 243-01, Japan
SO Journal of Photopolymer Science and Technology (1997), 10(4), 651-656
CODEN: JSTEEW; ISSN: 0914-9244
PB Technical Association of Photopolymers, Japan
DT Journal
LA English
AB We have recently proposed a **nanocomposite** resist system that incorporates sub-nm size fullerene C60 mols. into a conventional resist material. This new resist system leads to a substantial improvement of the various aspects of resist performance necessary for **nanometer** pattern fabrication with no significant process change. Fullerene (C60) is found to be an excellent material for incorporation in view of its mol. size, etching resistance, and composite preparation capability. This paper describes the basic characteristics of **nanocomposite** resist systems of C60 and two conventional electron-beam pos. resists, polymethyl methacrylate (PMMA) and a highly etching durable resist, ZEP520. Further, improvement of the environmental stability of a C60-incorporated chemical amplified neg. resist, SAL601, and a pos. one, SEPR-44-D, is also discussed.
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
ST photoresist resist fullerene C60 **nanocomposite**
IT Photoresists
(UV; C60-incorporated **nanocomposite** resist system for improving environmental stability)
IT Photolithography
(submicron UV; C60-incorporated **nanocomposite** resist system for improving environmental stability)
IT 99685-96-8, Fullerene (C60)
RL: MOA (Modifier or additive use); USES (Uses)
(C60-incorporated **nanocomposite** resist system for improving environmental stability)
IT 9011-14-7, Poly(methyl methacrylate) **43127-35-1**, ZEP 520
119574-53-7, SAL 601 195459-85-9, SEPR 44D
RL: TEM (Technical or engineered material use); USES (Uses)
(C60-incorporated **nanocomposite resist** system for improving environmental stability)
IT **43127-35-1**, ZEP 520
RL: TEM (Technical or engineered material use); USES (Uses)
(C60-incorporated **nanocomposite resist** system for improving environmental stability)
RN 43127-35-1 HCAPLUS
CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

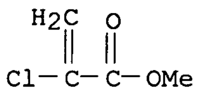
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



L31 ANSWER 34 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 1997:471386 HCAPLUS
DN 127:227283
TI Linewidth fluctuations caused by polymer aggregates in resist films
AU Yamaguchi, Toru; Namatsu, Hideo; Nagase, Masao; Yamazaki, Kenji; Kurihara, Kenji
CS NTT Basic Research Laboratories, Atsugi, 243-01, Japan
SO Journal of Photopolymer Science and Technology (1997), 10(4), 635-640
CODEN: JSTEEW; ISSN: 0914-9244
PB Technical Association of Photopolymers, Japan
DT Journal
LA English
AB We investigate the linewidth fluctuation in resist patterns, which is a serious problem in electron beam **nanolithog.** Granular structures with a diameter of 20-30 nm have been observed in resist films. We have determined that these structures cause the linewidth fluctuations. The granules are made up of polymer aggregates. We discuss the origin of the aggregates from the point that their size depends on the polymer mol. weight We also show that linewidth fluctuation is reduced when the pattern size is less than the aggregate size. The linewidth dependence of the linewidth fluctuation can be explained by the influence of the resist polymer aggregate on the development behavior.
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
ST lithog electron beam resist polymer aggregate; linewidth fluctuation electron beam resist
IT Electron beam lithography
Electron beam resists
Molecular association
Molecular weight distribution
(electron beam **nanolithog.** problem of linewidth fluctuations in resist patterns caused by polymer aggregates)
IT **43127-35-1**, ZEP 520
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)

(electron beam **nanolithog.** problem of linewidth fluctuations in **resist** patterns caused by polymer aggregates)

IT **43127-35-1,** ZEP 520

RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)

(electron beam **nanolithog.** problem of linewidth fluctuations in **resist** patterns caused by polymer aggregates)

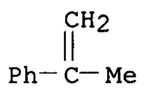
RN 43127-35-1 HCAPLUS

CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

CM 1

CRN 98-83-9

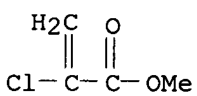
CMF C9 H10



CM 2

CRN 80-63-7

CMF C4 H5 Cl O2



L31 ANSWER 35 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1997:172971 HCAPLUS

DN 126:299609

TI **Nanocomposite** resist system

AU Ishii, Tetsuyoshi; Nozawa, Hiroshi; Tamamura, Toshiaki

CS NTT Opto-Electronics Labs., Atsugi, 243-01, Japan

SO Applied Physics Letters (1997), 70(9), 1110-1112

CODEN: APPLAB; ISSN: 0003-6951

PB American Institute of Physics

DT Journal

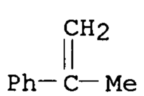
LA English

AB We propose a **nanocomposite** resist system that incorporates sub-nm carbon particles into a resist film to enable an ultrathin film resist process for **nanometer** pattern fabrication. Fullerene (C60) is found to be an excellent material for incorporation in view of its etching resistance, dissoln. inhibiting effect, mol. size, and composite preparation A **nanocomposite** system of C60 and an electron-beam pos. resist, ZEP520, show enhancements in both pattern contrast and etching resistance and provide 50 nm patterns in a 50-nm-thick film with a sensitivity of .apprx.50 μC/cm2. Furthermore, a C60-incorporated chemical amplified resist, SAL601, shows strong environmental stabilization in postexposure delay (<10% after five days) presumably due to the reduction of free volume in the closely packed

nanocomposite film.
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
ST **nanocomposite** resist system fullerene ZEP520 SAL601; lithog composite resist fullerene contg
IT Photoresists
(chemical amplified; **nanocomposite** resist system containing C60 fullerene and chemical amplified resist SAL601)
IT Electron beam resists
(**nanocomposite** resist system containing C60 fullerene and electron-beam pos. resist ZEP520)
IT 75-59-2, Tetramethylammonium hydroxide
RL: NUU (Other use, unclassified); USES (Uses)
(developer; **nanocomposite** resist system containing C60 fullerene and conventional resist material)
IT 119574-53-7, SAL601
RL: TEM (Technical or engineered material use); USES (Uses)
(**nanocomposite** resist system containing C60 fullerene and chemical amplified resist SAL601)
IT 99685-96-8, C60 Fullerene
RL: TEM (Technical or engineered material use); USES (Uses)
(**nanocomposite** resist system containing C60 fullerene and conventional resist material)
IT **43127-35-1**, ZEP520
RL: TEM (Technical or engineered material use); USES (Uses)
(**nanocomposite resist** system containing C60 fullerene and electron-beam pos. **resist** ZEP520)
IT **43127-35-1**, ZEP520
RL: TEM (Technical or engineered material use); USES (Uses)
(**nanocomposite resist** system containing C60 fullerene and electron-beam pos. **resist** ZEP520)
RN 43127-35-1 HCAPLUS
CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

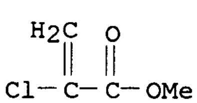
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

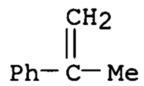
CRN 80-63-7
CMF C4 H5 Cl O2



L31 ANSWER 36 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 1997:110115 HCAPLUS
DN 126:256966
TI A **nano**-composite resist system: a new approach to
nanometer pattern fabrication
AU Ishii, T.; Nozawa, H.; Tamamura, T.
CS NTT Opto-electronics Laboratories, 3-1, Morinosato Wakamiya, Atsugi,
Kanagawa, 243-01, Japan
SO Microelectronic Engineering (1997), 35(1-4, Micro- and Nano-Engineering
96), 113-116
CODEN: MIENEF; ISSN: 0167-9317
PB Elsevier
DT Journal
LA English
AB We propose a **nano**-composite resist system which incorporates
highly etching resistant carbon sub-nm particles into a conventional
resist material to realize an ultra-thin resist process for practical
nanometer pattern fabrication. Buckminsterfullerene (C60) is
found to be an excellent material for incorporation in view of its etching
resistance, mol. size, and composite preparation **Nano**-composites of
polymethyl methacrylate (PMMA) resist and a highly etching durable resist,
ZEP520, show enhancements in both etching resistance and pattern contrast
maintaining the same sensitivity as the original base resists.
Furthermore, a C60-incorporated chemical amplified resist, SAL601, shows
strong environmental stabilization presumably due to the reduction of free
volume in the **nano**-composite film.
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other
Reprographic Processes)
Section cross-reference(s): 76
ST thin resist film etch resistance **nanocomposite**;
nanocomposite resist fullerene electron beam lithog
IT Electron beam lithography
Etching
Nanocomposites
Resists
(ultra-thin resist film with high etch-resistance from
nanocomposite resist systems containing C60 fullerene for
electron-beam lithog.)
IT 9011-14-7, PMMA **43127-35-1**, ZEP520 99685-96-8, C60 Fullerene
119574-53-7, SAL601
RL: TEM (Technical or engineered material use); USES (Uses)
(ultra-thin **resist** film with high etch-**resistance**
from **nanocomposite resist** systems containing C60
fullerene for electron-beam lithog.)
IT **43127-35-1**, ZEP520
RL: TEM (Technical or engineered material use); USES (Uses)
(ultra-thin **resist** film with high etch-**resistance**
from **nanocomposite resist** systems containing C60
fullerene for electron-beam lithog.)
RN 43127-35-1 HCAPLUS
CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with
(1-methylethenyl)benzene (9CI) (CA INDEX NAME)

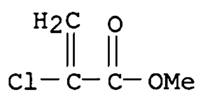
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



L31 ANSWER 37 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 1997:66116 HCAPLUS
DN 126:150400
TI Application of direct-write electron-beam **lithography** for deep-submicron fabrication
AU Shy, S. L.; Yew, J. Y.; Nakamura, K.; Chang, C. Y.
CS National Nano Device Laboratory, Hsinchu, 30050, Taiwan
SO Proceedings of SPIE-The International Society for Optical Engineering (1996), 2884(16th Annual Symposium on Photomask Technology and Management, 1996), 334-343
CODEN: PSISDG; ISSN: 0277-786X
PB SPIE-The International Society for Optical Engineering
DT Journal
LA English
AB **Lithog.** is one of the most important techniques in the IC fabrication and has been extensively used in processing. The high **resolution** and accuracy of electron beam **lithog.** is most appropriate for making mask of optical and x-ray **lithog.** as well as direct writing on wafer. Two types of resist, ZEP-520 pos. resist and SAL-601 neg. resist, were prepared for used in the electron beam **lithog.** Three different patterns, which include isolated line, contact hole and line & space patterns were exposed on the tungsten, oxide, and metal substrates, resp. The 0.15 μ m **resolution** of **lithog.** patterns was achieved. For the etching of polysilicon and oxide, well defined profile of polysilicon gate with 0.1 μ m width and well-defined tapered profiles of oxide contact hole have been obtained successfully.
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
Section cross-reference(s): 76
ST electron **lithog** direct write submicron fabrication
IT Electron beam **lithography**
(direct-write; processing conditions effect on direct-write electron-beam **lithog.** for deep-submicron fabrication using ZEP-520 pos. resist and SAL-601 neg. resist)
IT Sputtering
(etching, helicon wave; processing conditions effect on direct-write electron-beam **lithog.** for deep-submicron fabrication using

ZEP-520 pos. resist and SAL-601 neg. resist)

IT Electron beam resists
(processing conditions effect on direct-write electron-beam **lithog.** for deep-submicron fabrication using ZEP-520 pos. resist and SAL-601 neg. resist)

IT Etching
(sputter, helicon wave; processing conditions effect on direct-write electron-beam **lithog.** for deep-submicron fabrication using ZEP-520 pos. resist and SAL-601 neg. resist)

IT 10028-15-6, Ozone, uses
RL: NUU (Other use, unclassified); USES (Uses)
(ashing with; processing conditions effect on direct-write electron-beam **lithog.** for deep-submicron fabrication using ZEP-520 pos. resist and SAL-601 neg. resist)

IT 75-46-7 75-73-0 7782-44-7, Oxygen, uses 10035-10-6, Hydrobromic acid, uses
RL: NUU (Other use, unclassified); USES (Uses)
(plasma; processing conditions effect on direct-write electron-beam **lithog.** for deep-submicron fabrication using ZEP-520 pos. resist and SAL-601 neg. resist)

IT 7440-21-3, Silicon, processes
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(polycryst.; processing conditions effect on direct-write electron-beam **lithog.** for deep-submicron fabrication using ZEP-520 pos. resist and SAL-601 neg. resist)

IT 7631-86-9, Silica, processes
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(processing conditions effect on direct-write electron-beam **lithog.** for deep-submicron fabrication using ZEP-520 pos. resist and SAL-601 neg. resist)

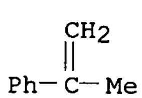
IT **43127-35-1**, ZEP-520 119574-53-7, SAL-601
RL: TEM (Technical or engineered material use); USES (Uses)
(processing conditions effect on direct-write electron-beam **lithog.** for deep-submicron fabrication using ZEP-520 pos. **resist** and SAL-601 neg. **resist**)

IT **43127-35-1**, ZEP-520
RL: TEM (Technical or engineered material use); USES (Uses)
(processing conditions effect on direct-write electron-beam **lithog.** for deep-submicron fabrication using ZEP-520 pos. **resist** and SAL-601 neg. **resist**)

RN 43127-35-1 HCAPLUS
CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

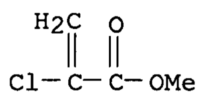
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



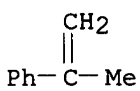
RE.CNT 3 THERE ARE 3 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L31 ANSWER 38 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 1997:14096 HCAPLUS
DN 126:137571
TI Extendibility of synchrotron radiation **lithography** to the sub-100 nm region
AU Deguchi, Kimiyoshi; Miyoshi, Kazunori; Oda, Masatoshi; Matsuda, Tadahito; Ozawa, Akira; Yoshihara, Hideo
CS NTT LSI Laboratories, Kanagawa, 243-01, Japan
SO Journal of Vacuum Science & Technology, B: Microelectronics and Nanometer Structures (1996), 14(6), 4294-4297
CODEN: JVTBD9; ISSN: 0734-211X
PB American Institute of Physics
DT Journal
LA English
AB This article discusses the **resolution** of synchrotron radiation **lithog.** in the sub-100 nm region, taking into consideration the mass production of large-scale integrated circuits, under attainable conditions for the x-ray mask, proximity gap, and resist processes. **Resolution** and exposure latitude for line-and-space patterns are markedly improved by using a mask with a contrast of only 2.5. Resolns. of 90, 80, 70, and 60 nm can be achieved with proximity gaps of 30, 20, 15, and 10 μm if a high-contrast resist and a low-surface tension developer are used. The latitude well be 10% for pattern sizes as small as 70 nm when the proximity gap is narrower than 15 μm. The effects of mask duty [which is defined to be the ratio of the absorber (line) width to the pattern pitch, i.e., duty cycle] on the optimum exposure dose and mask linearity are also evaluated.
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
Section cross-reference(s): 76
ST synchrotron radiation **lithog** low contrast photomask
IT Simulation and Modeling, physicochemical
X-ray **lithography**
X-ray masks
(**resolution** of synchrotron radiation **lithog.** obtainable in sub-100 nm region with low-contrast mask)
IT 24979-70-2, Poly(p-hydroxystyrene) **43127-35-1,** ZEP520
119574-53-7, SAL601
RL: TEM (Technical or engineered material use); USES (Uses)
(**resist; resolution** of synchrotron radiation **lithog.** obtainable in sub-100 nm region with low-contrast mask)
IT **43127-35-1,** ZEP520
RL: TEM (Technical or engineered material use); USES (Uses)
(**resist; resolution** of synchrotron radiation **lithog.** obtainable in sub-100 nm region with low-contrast mask)
RN 43127-35-1 HCAPLUS

CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

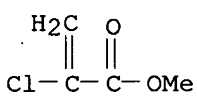
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2

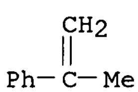


L31 ANSWER 39 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 1997:12984 HCAPLUS
DN 126:124670
TI High **resolution** electron beam **lithography** using ZEP-520 and KRS resists at low voltage
AU Tanenbaum, D. M.; Lo, C. W.; Isaacson, M.; Craighead, H. G.; Rooks, M. J.; Lee, K. Y.; Huang, W. S.; Chang, T. H. P.
CS School of Applied and Engineering Physics, Cornell University, Ithaca, NY, 14853, USA
SO Journal of Vacuum Science & Technology, B: Microelectronics and Nanometer Structures (1996), 14(6), 3829-3833
CODEN: JVTBD9; ISSN: 0734-211X
PB American Institute of Physics
DT Journal
LA English
AB ZEP-520 and KRS resist systems have been evaluated as candidates for use in low voltage electron beam **lithog.** ZEP-520 is a conventional chain scission resist which has a pos. tone for over two orders of magnitude in exposure dose. KRS is a chemical amplified resist which can be easily tone reversed with a sensitivity .apprx.8 μC/cm2 at 1 keV. Both resist systems are shown to have sensitivities .apprx.1 μC/cm2 for pos. tone area exposures to 1 keV electrons. A decrease in contrast in 50 nm thick resist layers is seen when exposure voltage is lowered from 2 to 1 keV, indicating nonuniform energy deposition over the resist thickness. High **resolution** single pass lines have been transferred into both Si and SiO2 substrates at both low and high voltages in each resist system without using multilayer resist masks. The ZEP-520 and KRS resists are shown to have resolns. of 50 and 60 nm, resp., at 1 kV, within a factor of 2 of their high voltage resolns. under identical development conditions. A cusp shaped etch profile in Si allows high aspect ratio 20 nm wide trenches to be fabricated using these resists on bulk Si. Low voltage

exposures have been used to pattern gratings with periods as small as 75 and 100 nm in ZEP-520 and KRS, resp. Low voltage exposures on SiO2 show no indications of pattern distortion due to charging or proximity effects.
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
ST electron beam **lithog** ZEP520 KRS resist
IT Electron beam **lithography**
Electron beam resists
(high **resolution** electron beam **lithog.** using ZEP-520 and KRS resists at low voltage)
IT **43127-35-1**, ZEP-520 174254-81-0, KRS
RL: TEM (Technical or engineered material use); USES (Uses)
(high **resolution** electron beam **lithog.** using ZEP-520 and KRS **resists** at low voltage)
IT **43127-35-1**, ZEP-520
RL: TEM (Technical or engineered material use); USES (Uses)
(high **resolution** electron beam **lithog.** using ZEP-520 and KRS **resists** at low voltage)
RN 43127-35-1 HCAPLUS
CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

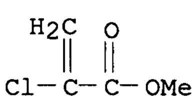
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2

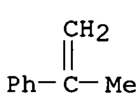


L31 ANSWER 40 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 1996:307121 HCAPLUS
DN 124:356046
TI Sub-0.1 μm patterning with high aspect ratio of 5 achieved by preventing pattern collapse
AU Yamashita, Yoshio
CS SORTEC Corporation, Ibaraki, 300-42, Japan
SO Japanese Journal of Applied Physics, Part 1: Regular Papers, Short Notes & Review Papers (1996), 35(4A), 2385-2386
CODEN: JAPNDE; ISSN: 0021-4922
PB Japanese Journal of Applied Physics
DT Journal

LA English
AB High **resolution** patterns of deep sub-quarter micron delineated by X-ray, E-beam and optical **lithogs.** have been widely reported. Pattern collapse during the development steps has become the main obstacle to obtaining higher **resolution** To overcome this difficulty a very low surface tension rinser has been evaluated in development processes. Perfluorohexane has a low surface tension of about 10 dyne/cm. For 0.08 μm lines and spaces a high aspect ratio of more than 5 can be delineated in 0.45-μm-thick ZEP resist using perfluorohexane as a rinser, where an aspect ratio of more than 4 cannot be achieved using water or conventional organic solvent rinsers.
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
ST perfluorohexane low surface tension rinser photolithog
IT **Lithography**
(x-ray, perfluorohexane as low surface tension rinser in x-ray photolithog. for high aspect ratio patterning)
IT 355-42-0, Perfluorohexane
RL: TEM (Technical or engineered material use); USES (Uses)
(perfluorohexane as low surface tension rinser in x-ray photolithog. for high aspect ratio patterning)
IT **43127-35-1**, ZEP-520
RL: TEM (Technical or engineered material use); USES (Uses)
(**resist**; perfluorohexane as low surface tension rinser in x-ray photolithog. for high aspect ratio patterning)
IT **43127-35-1**, ZEP-520
RL: TEM (Technical or engineered material use); USES (Uses)
(**resist**; perfluorohexane as low surface tension rinser in x-ray photolithog. for high aspect ratio patterning)
RN 43127-35-1 HCAPLUS
CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

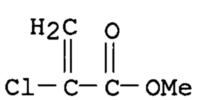
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



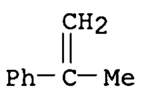
L31 ANSWER 41 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1995:838118 HCAPLUS
DN 124:18205
TI High precision EB technology with thin EB resist and distortion-free mask holder for x-ray mask fabrication
AU Noda, Shuichi; Hoga, Hiroshi
CS Semiconductor Technology Laboratory, Oki Electric Industry Co., Ltd., Hachioji, 193, Japan
SO Proceedings of SPIE-The International Society for Optical Engineering (1995), 2512, 142-51
CODEN: PSISDG; ISSN: 0277-786X
DT Journal
LA English
AB EB **lithog.** and dry etching technol. have been investigated to improve EB pattern **resolution** and pattern placement accuracy. High selective reactive ion etching of W absorber and thin EB resist process have been developed adopting intermediate Ti mask layer between the EB resist and W. The EB resist pattern **resolution** on the W absorber covered by thin Ti mask layer was improved by thinning EB resist and it became possible to obtain 0.12 µm-pitch line/space pattern with 0.1 µm-thick EB resist. Pattern size decrement from the designed pattern size was also effective to improve the resist pattern **resolution** The W absorber was etched with very high selectivity above 500 to the Ti mask layer using Cl2+O2 gas system. Using this RIE technique, it became possible to etch 0.7 µm-thick W absorber with 0.05 µm-thick EB resist and 0.03 µm-thick Ti mask layer. Further, a distortion-free X-ray mask holder for EB writing system has been developed, which is estimated to reduce pattern displacement caused by mask clamping to less than 3 nm within a radius of 10 mm exposure field as far as the clamping distortion was concerned.
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
ST x ray photomask electron beam resist
IT Etching
(x-ray mask fabrication using thin electron-beam resist and distortion-free mask holder)
IT **Lithography**
Resists
(electron-beam, x-ray mask fabrication using thin electron-beam resist and distortion-free mask holder)
IT Photomasks
(x-ray, x-ray mask fabrication using thin electron-beam resist and distortion-free mask holder)
IT 7440-33-7, Tungsten, uses
RL: DEV (Device component use); USES (Uses)
(absorber; x-ray mask fabrication using thin electron-beam resist and distortion-free mask holder)
IT 7782-44-7, Oxygen, processes 7782-50-5, Chlorine, processes
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(etchant; x-ray mask fabrication using thin electron-beam resist and distortion-free mask holder)
IT 7440-32-6, Titanium, uses
RL: DEV (Device component use); USES (Uses)
(intermediate mask layer; x-ray mask fabrication using thin electron-beam resist and distortion-free mask holder)
IT **43127-35-1**, ZEP-520
RL: TEM (Technical or engineered material use); USES (Uses)
(**resist**; x-ray mask fabrication using thin electron-beam **resist** and distortion-free mask holder)

IT **43127-35-1**, ZEP-520
RL: TEM (Technical or engineered material use); USES (Uses)
(**resist**; x-ray mask fabrication using thin electron-beam **resist** and distortion-free mask holder)
RN 43127-35-1 HCAPLUS
CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

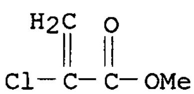
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2

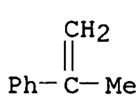


AN 1995:326121 HCAPLUS
DN 122:226558
TI Electron beam **nanolithography** with image reversal by ECR plasma oxidation
AU Kurihara, K.; Iwadate, K.; Namatsu, H.; Nagase, M.; Murase, K.
CS NTT LSI Laboratories 3-1, Morinosato Wakamiya, Atsugi-shi, Kanagawa, 243-01, Japan
SO Microelectronic Engineering (1995), 27(1-4), 125-8
CODEN: MIENEF; ISSN: 0167-9317
PB Elsevier
DT Journal
LA English
AB A new image-reversal process has been developed for electron beam **nanolithog**. This process is based on Si oxidation with ECR oxygen plasma through openings in resist patterns. Si on SiO2 is selectively etched by either Cl2-based ECR plasma etching or KOH anisotropic etching. This image-reversal process achieves 10-nm-scale Si line and dot patterns.
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
Section cross-reference(s): 76
ST image reversal electron beam **nanolithog**; silicon oxidn electron beam **nanolithog**
IT Etching
Oxidation
(image-reversal based on silicon oxidation with ECR plasma in

nanofabrication with e-beam lithog.)
IT Lithography
(electron-beam, submicron, image-reversal based on silicon oxidation with ECR plasma in **nanofabrication** with e-beam lithog.)
IT 1310-58-3, Potassium hydroxide (KOH), processes 2551-62-4, Sulfur hexafluoride 7782-50-5, Chlorine, processes
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(etchant; image-reversal based on silicon oxidation with ECR plasma in **nanofabrication** with e-beam lithog.)
IT 7631-86-9, Silica, processes
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(image-reversal based on silicon oxidation with ECR plasma in **nanofabrication** with e-beam lithog.)
IT 7440-21-3, Silicon, reactions
RL: PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(image-reversal based on silicon oxidation with ECR plasma in **nanofabrication** with e-beam lithog.)
IT 7782-44-7, Oxygen, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(plasma; image-reversal based on silicon oxidation with ECR plasma in **nanofabrication** with e-beam lithog.)
IT **43127-35-1**, ZEP520
RL: TEM (Technical or engineered material use); USES (Uses)
(**resist**; image-reversal based on silicon oxidation with ECR plasma in **nanofabrication** with e-beam lithog.)
IT **43127-35-1**, ZEP520
RL: TEM (Technical or engineered material use); USES (Uses)
(**resist**; image-reversal based on silicon oxidation with ECR plasma in **nanofabrication** with e-beam lithog.)
RN 43127-35-1 HCAPLUS
CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

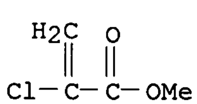
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2

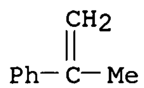


L31 ANSWER 43 OF 43 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 1993:136038 HCAPLUS
DN 118:136038
TI Quantum wire fabrication by electron-beam **lithography** using high-**resolution** and high-sensitivity electron-beam resist ZEP-520
AU Nishida, Toshio; Notomi, Masaya; Iga, Ryuzo; Tamamura, Toshiaki
CS Opto-Electron. Lab., NTT, Atugi, 243-01, Japan
SO Japanese Journal of Applied Physics, Part 1: Regular Papers, Short Notes & Review Papers (1992), 31(12B), 4508-14
CODEN: JAPNDE; ISSN: 0021-4922
DT Journal
LA English
AB The **resolution** of the pos. electron-beam resist ZEP-520 is evaluated using finely focused electron-beam exposure for the application of quantum wire fabrication in a large area. Compared with PMMA resist conventionally used for **nanofabrication**, ZEP resist shows almost the same **resolution** under sensitivity improvement of one order of magnitude, and the throughput is increased by a factor of >100 by introducing a highly bright Zr/O/W thermal field emitter as an electron-beam source. Other excellent performance characteristics, such as high dry-etching durability and process stability, allow to apply ZEP resist for larger-area, high-d. quantum wire fabrication. By both wet chemical etching and dry-etching combined with CBE selective growth, InGaAs **nanostructures** as small as 15 nm can be obtained with a pitch of 70 nm over several hundred μm squares.
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other **Reprographic** Processes)
ST electron beam **lithog** quantum wire fabrication; resist electron **lithog** quantum wire fabrication
IT Resists
(electron-beam, performance characteristics of ZEP-520, for quantum wire fabrication)
IT Semiconductor devices
(quantum wires, fabrication of, by electron-beam **lithog.** using high-**resolution** and high-sensitivity electron-beam resist ZEP-520)
IT **43127-35-1**, ZEP-520
RL: USES (Uses)
(electron-beam **lithog.** performance characteristics of **resist** of, for fabrication of quantum wires)
IT 7664-93-9, Sulfuric acid, uses 7722-84-1, Hydrogen peroxide, uses
RL: USES (Uses)
(etching characteristics of electron-beam resist ZEP-520 in solution containing, for fabrication of quantum wires)
IT 76-16-4 2551-62-4, Sulfur hexafluoride
RL: USES (Uses)
(etching durability in, of electron-beam resist ZEP-520 for fabrication of quantum wires)
IT 22398-80-7, Indium phosphide, uses 106070-25-1, Indium gallium arsenide
RL: USES (Uses)
(**lithog.** fabrication of quantum wires in, using electron-beam resist ZEP-520)
IT **43127-35-1**, ZEP-520
RL: USES (Uses)
(electron-beam **lithog.** performance characteristics of **resist** of, for fabrication of quantum wires)
RN 43127-35-1 HCAPLUS

CN 2-Propenoic acid, 2-chloro-, methyl ester, polymer with (1-methylethenyl)benzene (9CI) (CA INDEX NAME)

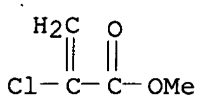
CM 1

CRN 98-83-9
CMF C9 H10



CM 2

CRN 80-63-7
CMF C4 H5 Cl O2



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